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A SMALL POULTRY FARM.

BY G. P.

INTRODUCTION—DIMENSIONS OF VARIOUS BUILDINGS — MATERIALS FOR VARIOUS PARTS: WILLESDEN PAPER, MATCH-BOARDING—CONSTRUCTION OF FRAMEWORK: SETTING OF CORNER POSTS, FIXING CROSS-RAILS, SETTING AND FIXING RAFTERS OF POULTRY HOUSE, SETTING AND FIXING RAFTERS OF COOPS.

Introduction.—Much is written and talked in the present day on the subject of poultry farming. One enthusiastic party declares that this much-neglected branch of farming is the thing which is wanted to do away with hard times. We see columns of figures to prove how much money goes out of Great Britain for eggs and poultry; and the writers of these columns generally have another set of figures to prove how easily the British farmer might divert the stream, and land all these hundreds of pounds in his own pocket. On the other side, we hear of the utter failure of attempted poultry farms; the difficulty of keeping a large number of fowls in health on the same ground; the obstinate way in which hens refuse to lay at the time eggs are fetching a good price; the prodigal way in which they present us with eggs when they are scarcely worth selling; and so on, and so on. My own opinion, after a good many years' experience as a poultry keeper, is that there is a good

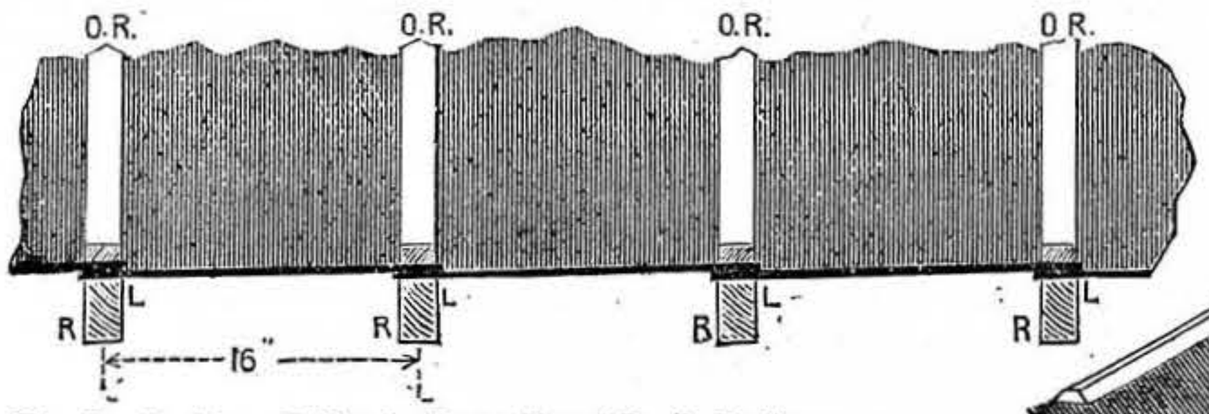

Fig. 5.—Section of Fig. 4 along line A B—R, Rafters; W R, Willesden Roofing; L, Three-inch Overlap at Joints; O R, Outside Rafter.

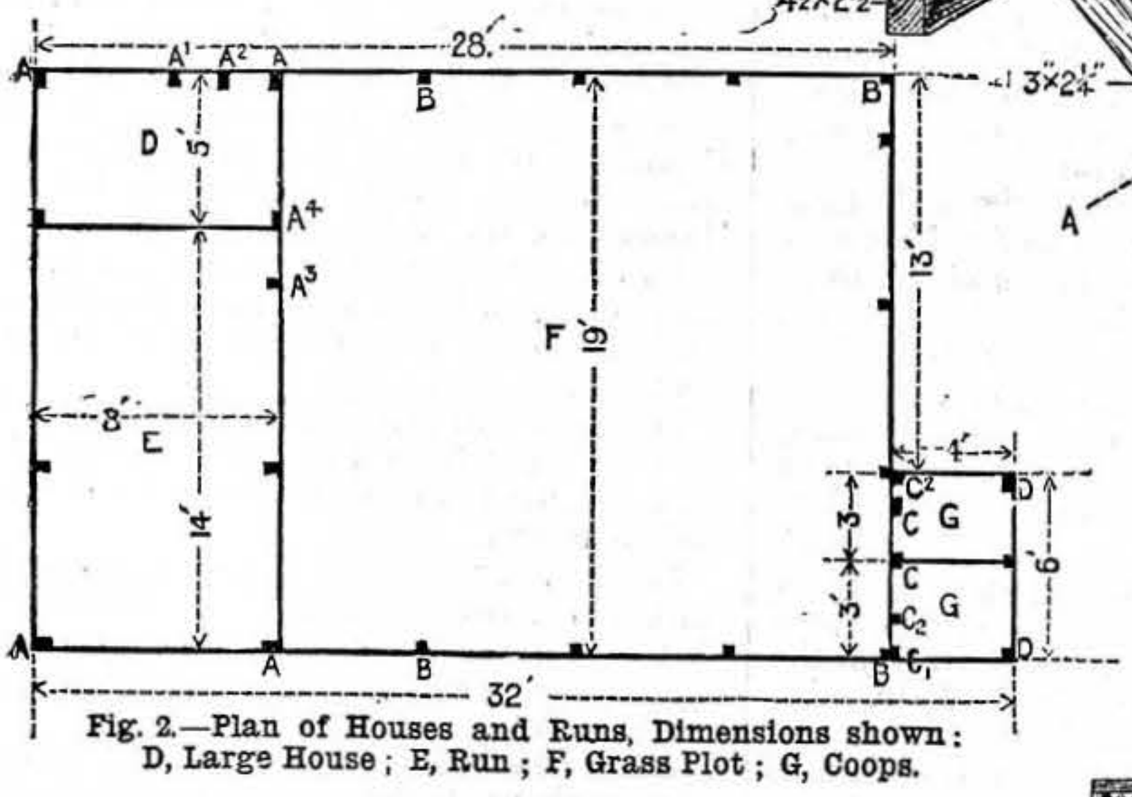

Fig. 2.—Plan of Houses and Runs, Dimensions shown: D, Large House; E, Run; F, Grass Plot; G, Coops.

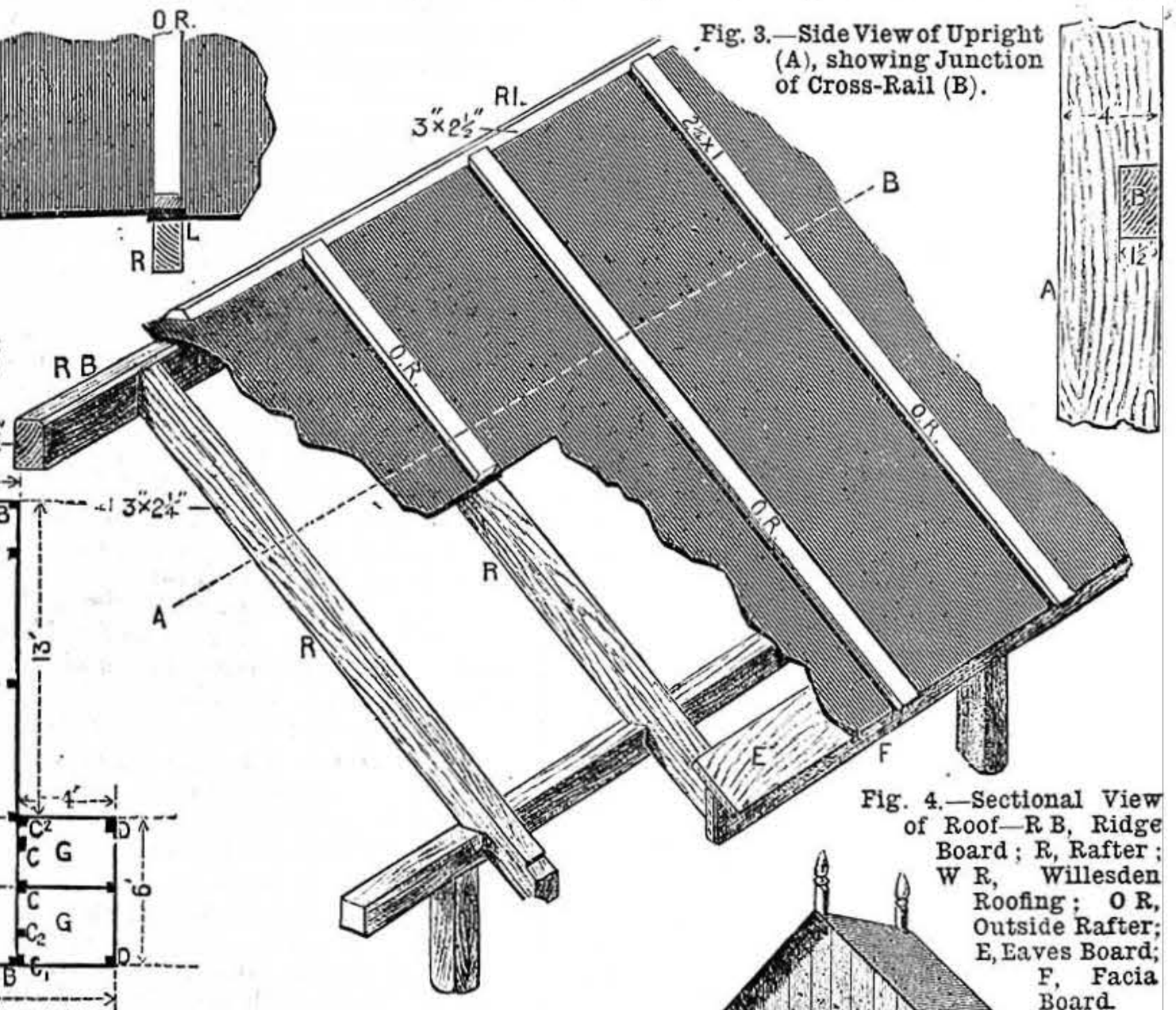

Fig. 4.—Sectional View of Roof—R B, Ridge Board; R, Rafter; W R, Willesden Roofing; O R, Outside Rafter; E, Eaves Board; F, Facia Board.

Fig. 3.—Side View of Upright (A), showing Junction of Cross-Rail (B).

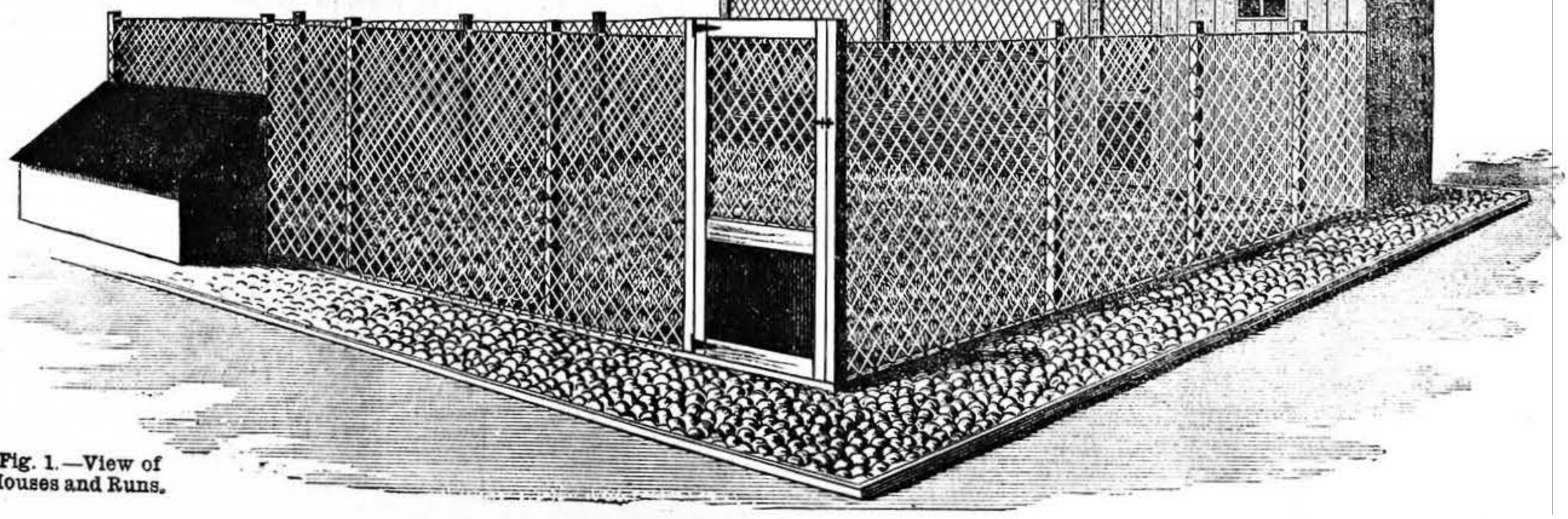

Fig. 1.—View of Houses and Runs.

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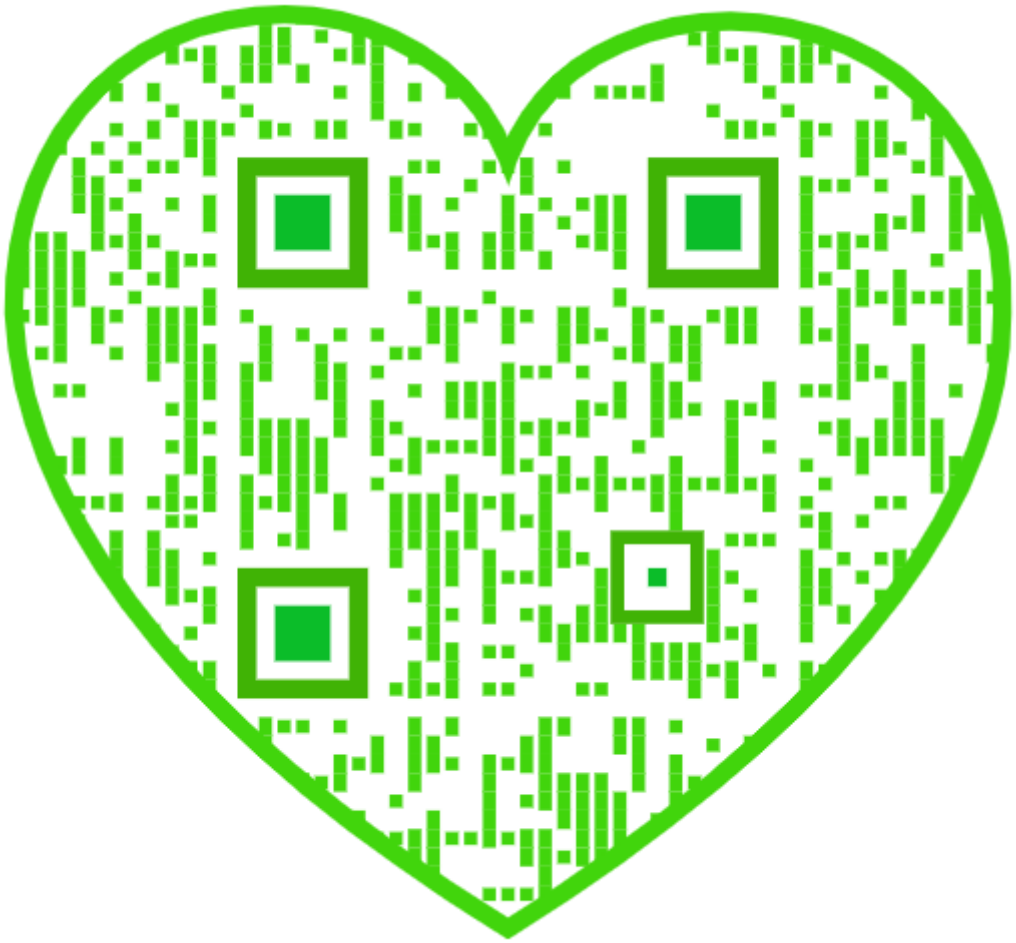

deal to be said on both sides of the question. I confidently believe that hens properly housed, well attended to, getting good grain and soft food, green meat—such as grass or vegetables—and not overfed, pay well, the annual profit being fully 4s. per hen. But it is recognised by all experienced in poultry keeping that the first essential to success is thoroughly good housing; and it is with the object of showing my readers how to construct a thoroughly good, water-proof, draught-proof, and warm abode for their fowls that I write this paper. The illustration (Fig. 1) is a view of a small poultry yard. The original has been in use for a number of years, and has been found to be very satisfactory. It is compact, very convenient, and suitable for an amateur poultry keeper, providing him with room for one variety, and also with accommodation for hatching eggs and rearing chickens.

Dimensions of Various Buildings.—The poultry farm consists of one large house, 8 ft. 4 in. long by 5 ft. broad, by 6 ft. high at the eaves and 8 ft. 9 in. high at the ridge; with a run 14 ft. long by 18 ft. 4 in. wide by 6 ft. high, attached. In front of this house and run is a grass plot 20 ft. long by 19 ft. broad; and at the side of this grass plot, remote from the house and run, are two or three chicken-coops, in which eggs are hatched and chickens reared.

Materials for Various Parts. — Before commencing to build, we will, of course, have to provide ourselves with materials, a complete list of which will be given at the end. In that list it will be noticed that a material called Willesden Paper is mentioned, and as some—perhaps most—of my readers may not be familiar with the name, I had better describe what the material is, and what it is used for.

Willesden Paper.—For a long time it has been known that paper, canvas, etc., when placed in a solution of cuprammonium hydroxide, become gelatinised and diffused through the liquid. This could not be made of any practical use until the Willesden Paper and Canvas Co. conceived the idea of passing the substances through at such a rate that the exterior of the fibres only was gelatinised; then, by subsequent drying, an elastic varnish was formed, which readily took up copper in the form of cuprocellulose, thus preventing the material from being affected by water or damp. The above-named Company have been now working the process, with such modifications as have been suggested by experience, with great success for a considerable time, and their goods are becoming more popular year by year; but as yet, the substance has not been very much used by amateurs—principally, I suppose, from their ignorance of there being such a material in the market. This is a great pity, and one which should be remedied. The two kinds of paper required for this building are the four-ply and the one-ply. The former is extensively used as a building material, and is required by us for the roofs of our buildings. For this it is especially suitable, for, besides being cheap and easily fixed, it is entirely weather-proof, being affected by neither damp, nor frost, nor excessive heat. It is much warmer than galvanised iron, and, area for area, is only one-ninth the weight. The one-ply papers are for underlining slates, partitions, damp walls, stencil-paper, etc. We are to make use of them for lining our houses, for, being rot-proof, water-proof, insect-proof, inodorous, and warm, they are just what is required for lining a poultry house. These papers may be had in rolls of any length, the four-ply 19 in., 27 in., and 54 in. wide, at 9d., 1s. 2d., and 2s. 3d. per yard run respectively; and the one-ply brown, No. 1.80, 56 in. wide, at 6d. per yard run, from the Willesden Paper and Canvas Works, Willesden Junction, London, N.W. It will thus be seen that the name "Willesden," as applied to the paper, is derived from the name of the town at which it is manufactured, and not from the process it has been subjected to.

Match-boarding.—I have mentioned this in the list to be used for covering the framework of the houses, not because it is preferable to Willesden, but because it may be put up at *slightly* less expense, and because it will suit the secondary purpose for which it is here required.

Construction of Framework.—Having now provided ourselves with the materials named in the list, we may set about the construction of our poultry house.

Setting Corner Posts.—We first take the eleven 4 in. by 2 in. posts, char the lower ends, and coat them well with coal-tar; then place them firmly 2 ft. in the ground, in the positions marked A, Fig. 2. As it is better to do all work of the same kind at one time, we had better now put in the corner posts for the chicken-coops, and also those for the fence round the grass plot. The poles for the plot are 1½ in. square, and are driven 2 ft. into the ground, in the positions indicated at B, Fig. 2. The height of the fence depends on the breed chosen. Cochins or Brahmas are easily retained within bounds by netting a yard high; for moderate-sized fowls, 5 ft. high will do; whilst to confine game, Hamburghs, or bantams, a fence of 8 ft. or 9 ft. in height will be found necessary. I have made provision for a fence 5 ft. high, this being the usual. The corner posts for the coops will have to be 2 in. by 2½ in., those marked D (Fig. 2) being 4 ft. long and placed 1½ ft. into the ground, while those marked C are 6 ft. long, and are placed 2 ft. into the ground. The lower ends of all these posts should be previously charred and coated with tar.

Fixing Cross-rails. — Horizontal rails, 3 in. by 1½ in., are now to be fixed between the uprights of the large house about 18 in. from the ground, and also across the top of the corner posts; while similar cross-pieces are fixed across the tops of, and half-way up, the posts round the *run*. When putting up these lower horizontal rails, spaces must be left for the doors into the house and into the run (see A, A_2, and A_3, A_4, Fig. 2). With regard to the coops, cross-pieces must be fixed along the tops of the corner posts of these, and similar cross-pieces 1 ft. from the ground. These rails are 2 in. by 2½ in.—*i.e.*, the same width and thickness as the uprights. "Oh! it is all very well telling us that it must be done; but how is it to be done?" I fancy I hear some amateur say. Well, it is really so simple I had almost passed it over. But let me answer: "Principally with nails." The rails are made to fit exactly between the uprights, and are nailed there with two or three 2½ in. nails, put in on the slope. Those pieces round the large house and run had, however, better be let into the uprights (see Fig. 3).

Setting and Fixing of Rafters of Poultry House.—Good and cheap rafters for the roof of the house may be obtained by sawing two flat cuts in 7 in. by 3 in. battens, which will give three pieces, each 3 in. by 2¼ in. Those for the ends of the house are 4 ft. 1½ in. long: they are halved into each other at their top ends, and the bottom ends are let into the top horizontal rail (see Fig. 4). The ridge board (Fig. 4) is now nailed on, and the remaining rafters, each 4 ft. long, are fixed as in Fig. 4. The correct spacing of rafters must be as shown in detail at section A B, Fig. 5—viz., 16 in. from centre to centre of rafter.

Setting and Fixing Rafters of Coops.—Similar construction is required for the roof of the coops, the only difference being that it is a *lean-to* roof—viz., one consisting of a single sloping piece—instead of a *span* roof, which consists of two sloping pieces forming an angle with each other, and which is really two lean-to roofs joined together. The rafters for this roof are 4 ft. 8 in. long.

Space forbids, and I must needs leave over the rest of my remarks for a future number of Work, at no very distant date.

HOW TO SECURE COPYRIGHT IN DESIGNS.

BY CHARLES KELSEY.

MAKING THE APPLICATION — WHERE TO OBTAIN APPLICATION FORMS: THEIR PRICE—FILLING UP THE APPLICATION FORM — STATEMENT OF NATURE OF DESIGN—THE REPRESENTATIONS — PROVISIONAL REGISTRATION — ISSUE OF CERTIFICATE—LENGTH OF COPYRIGHT—CONFLICTING DESIGNS—CONSENTS—INSPECTION OF CONFLICTING DESIGNS—ACTIONS FOR INFRINGEMENT.

HAVING in my previous paper dealt with the definition of a design and proprietor, and explained the conditions which must exist precedent to registration, and also explained the manner in which designs are subdivided for the purposes of registration, I will proceed to treat of the other matters relative to the subject.

Making the Application.—This consists in lodging at the Office an application form properly filled up, together with three representations of the design. I will deal in the first place with the application form.

Where to obtain Application Forms and their Price.—These are sold not at the Patent Office, but at the Inland Revenue Office, Royal Courts of Justice, London (Room No. 6). Also, speaking generally, at all the more important post-offices in the kingdom; and if not kept in stock, may be ordered at any money-order office in the United Kingdom.

There are two principal forms: Forms E, for the classes from 1 to 12, cost 10s. each; Forms E, for the classes 13 and 14, cost 1s. each, stamped.

These fees, trifling in themselves, are all the expense that the application involves—that is, if the designer or inventor makes his application himself, without employing a patent agent.

When he intends to apply the same design, with, perhaps, various small modifications, to a set of articles such as are ordinarily on sale together—such as, for example, a dinner or dessert set, a tea or coffee service, a set of fire brasses, a suite of furniture or a suit of clothes—Form O, costing £1, should be used.

Filling up the Application Form.—First insert, in its proper place, the number of the class in which it is desired to register. This will be obtained from the list previously given. Or, in case of doubt, ask the Comptroller to decide for you, telling him of what materials the design is composed, and how it will be executed. Then insert the full name and address, and the trade, profession, or calling of the applicant. Then where the certificate is to be forwarded to; if the inventor is applying himself, he merely says to himself at the above address; but if a patent agent is.

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acting, he naturally inserts his own address, so as to have the certificate through his hands. And then, at the foot of the form, is a space for the insertion of the applicant's or his agent's signature, and for the date of the application.

If an agent is employed, the applicant signs a Form of Authorisation for the agent to act in his stead, which is filed with the application form.

So far, all is very simple, and the only point where any difficulty will be experienced is in filling up the remaining space. This is for the

Statement of Nature of Design.—By the Act and rules, the filling up of this part is made imperative, the object being to make the applicant define clearly what the registration is for. The applicant must therefore state whether it is the shape or configuration, the pattern or the ornament, or any two or more of these which he desires to protect.

He selects the most fitting term or terms, and after the foregoing remarks little difficulty will be experienced in this. If all is new—shape or configuration, pattern and ornament—and he desires to claim for all, he can do so. If only the pattern or ornament is new, he claims for this alone, and the same in reference to the shape.

If only a portion of the article is novel, he should claim only for that portion, distinguishing it by letters or figures corresponding to similar letters or figures upon the representations. A good plan is to tint the part claimed as new in some distinctive colour.

It is better also to indicate what the article is, in the claim—such as "Design for a Bicycle Frame. Applicable for the shape or configuration;" unless the drawing is self-intelligible, or words appear upon the drawing to that effect.

In cases where a new shape is designed which will be decorated in a variety of ways, it is best to claim for the shape alone, leaving the after-applied decorations to be specially applied for if considered sufficiently important. In cases where the design sought to be registered is a pattern or ornament which can be applied without modification to various articles—as in the transfer prints used for the decoration of china, or the engraved ornament applied to silver or electro-plated goods—the registration may be claimed in a general way for application to all the goods included in the particular class. But when the application is for the registration of a shape, this is hardly possible, as the application to varied articles to be used for distinct purposes necessitates variations in the shape, and such variations require to be separately registered, unless it is such a case as can be included under the Set form previously alluded to.

But the courts have held that mere variations in size, where the relative proportions of the various parts are not altered, will all be protected by the one application. This completes the filling up of the application form, and it will be seen that it is a very simple matter, which may be accomplished by almost any person without assistance, and thus the services of a patent agent may be dispensed with, and the payment of his fee avoided.

The Representations.—Accompanying each application form must be sent three exactly similar representations of the design. Considerable latitude is allowed on this point, which favours the applicant greatly. He can send drawings or tracings of his designs, impressions pulled from copper-plates, prints from wood blocks, such as are used for advertising the articles, photographs of the designs, rubbings from book-covers or flat metal goods; or in the cases, like textiles, paperhangings, and paper-like articles, actual pieces of the finished articles.

The drawings should be executed upon paper of foolscap size, 13 in. × 8 in., where possible, and two views may be shown, or in cases where more are required to show the design properly, this number can be amplified; they should be executed in ink, or, if in pencil, should be fixed by a wash of gum-water or water-colour, and the tracings must be upon tracing cloth—not upon thin tracing paper—so as to secure a permanent record of the design.

The drawings or tracings need not be artistically executed. The only requisite is that they should show the design properly and clearly; but very rough sketches should not be sent, for if the design is not shown properly, the loss will be the applicant's own.

Photographs should be mounted upon similar foolscap paper—not upon thick cardboard—and the applicant should, for his own safety, obtain permanent prints. If specimens are lodged, they should be of the same size—13 in. × 8 in.—as nearly as possible; but if a larger size is necessary to show the design properly, they will be accepted up to 21 in. × 12 in. If the pattern is not complete in this larger size, photographs of the pattern should be sent.

An applicant may easily decide for himself whether specimens of a particular design will be accepted in lieu of drawings or other representations, by asking himself whether the article is such a one as could be pasted into a book without cutting or bursting through the adjacent pages. Speaking generally, all that conform to these conditions will be accepted.

When sets of articles are required to be registered, the representations should show the variations which will occur on the different articles.

Provisional Registration.—In cases where the applicant wishes to secure an early date of registration before his drawings are executed, or other representations prepared, he can forward one sketch of his design with the application form, and this will be accepted by the Office, and the certificate will be dated from the day of the receipt of the application form; but no certificate will be issued until the proper drawings are sent.

The applicant must not deliver any articles on sale before the certificate is issued, or his registration will be invalidated, the Comptroller in such cases having the power to strike the design off the register.

The applicant may, however, after the date of the receipt by the Office of the sketch of the design, solicit orders to ascertain if it is worth while proceeding with his application. The sketch should be such as to show his design properly; and when sending the complete representations, he should not depart in any material particular from the one first lodged.

Issue of the Certificate.—About eight or ten days after the receipt of the application, if all is correct, the certificate of registration will be issued, and forwarded by post to the address given by the applicant.

If not in proper order, the applicant will have it returned to him to make the alterations desired by the Office, which will be indicated in the letter accompanying the returned documents; and on his amending as desired, the application will be proceeded with.

Length of Copyright.—The copyright granted in any of the classes lasts for a uniform period of five years from the date of receipt of application form at the Office.

Conflicting Designs.—When an application is made, the Office compares the design with the designs for similar articles previously registered, the term of copyright in which is still running; and if it is found that the design has been anticipated, or if it is obviously an imitation of any such design, the Comptroller will give the applicant notice of the fact, and inform him that he cannot proceed to issue the certificate. If the applicant desires to explain away the similarity, or urge reasons why a certificate should be granted to him, the Comptroller will fix a day for a personal interview, when the applicant or his agent can attend and go fully into the matter.

The Comptroller having heard all that can be urged in its favour, will decide whether or not he can issue a certificate of registration. If he decides against the applicant, an appeal against the Comptroller's decision to the Board of Trade is open, and, after hearing the applicant and the Comptroller, the Board will either endorse the Comptroller's decision, or decide against him, and direct him to register the design.

There is no fee for a hearing before the Comptroller, but if the applicant determines to appeal to the Board of Trade against the Comptroller's decision, a stamped Form F is required, which costs £1.

Of course, none of these difficulties will crop up if the design is a *bonâ-fide* original one.

This procedure acts as a deterrent to the class of imitators who are always ready to copy as nearly as possible the products of the ingenuity of other persons, if such are finding a sale, and acts very much to the advantage of the honest designer or inventor.

Consents.—The Comptroller will sometimes suggest where the design differs from some original one to a certain extent—and is yet at the same time evidently an imitation of it—that the latter applicant should procure the consent of the original proprietor, upon getting which, and lodging it with the Comptroller, he will proceed with the registration. The Comptroller will furnish the latter applicant with the original proprietor's name and address, so that communications may be opened for that purpose. In such cases the original inventor can often obtain a *quid pro quo* in exchange for giving his consent, and thus secure some return for the ingenuity which the latter applicant is desirous of taking advantage of. Of course, the proprietor can refuse to give his consent, and then the Comptroller does not proceed, unless directed to do so as the result of an appeal to the Board of Trade; and if the latter applicant still puts his design upon the market, without making any arrangement with the proprietor of the original design, he can be proceeded against for infringement, and if the courts decide against him, may be ordered to pay damages and costs.

If, on the other hand, the latter applicant thinks he has made no infringement, it is quite open for him to put his design upon the market; but he will have been warned of the risks he is running in so doing.

Here, again, the practice in the designs branch differs from the patent procedure, for patents can be secured for the same thing by as many different persons as choose to apply for them, so far as the Office is concerned, for it makes no search on the question of anticipation; but the patent specifications are all open to inspection for a certain time

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before the grant of a patent, to give time for oppositions to be lodged; whereas, the designs, during the term of copyright, are not open to the inspection of the general public without the consent of the proprietors.

Inspection of Conflicting Designs.—An exception to this rule of keeping all designs secret during the period of copyright, is made in the cases where the Comptroller informs an applicant that his design has been anticipated. The applicant or his agent can inspect the conflicting design or designs quoted by the Comptroller on payment of a fee of one shilling. This is generally done before a date for a hearing is asked to be fixed. This inspection of the conflicting design will enable the applicant to see how far, and in what respect, he has been anticipated.

Actions for Infringement.—This action of the Comptroller should not be considered as altogether final on the question of infringement. A certificate may be issued to the latter applicant, and still the earlier proprietor may feel aggrieved, and can institute an action if he chooses, when the courts will hear both sides, and come to a decision on the evidence tendered. The action of the Office in such cases is not infallible, and the decision arrived at may not be altogether correct from various causes. For instance, the Comptroller may not be in possession of all the material facts of the case, and in dealing with a large number of designs every day, it will be evident that mistakes or errors of judgment may be sometimes made, though every care be taken to obviate such. The issue of a certificate of registration stands on the same footing as the grant of a patent. It does not confer an unchallengeable right, for in either case the courts may cancel them, if it is shown that they have been wrongly issued. This is a point which is often not properly understood by novices in patent matters, who frequently consider when the Office has granted a patent or certificate of registration that their rights are secure and unchallengeable.

I must defer my remarks on the remaining portions of my subject to my next and concluding paper.

KNOTTING, SPLICING, AND WORKING CORDAGE.

BY LANCELOT L. HASLOPE.

Working Cordage.

Seizing — Sennit — French Sennit — Gaskets — Flemish Eye — Grommet — Selvagee — Worming, Parcelling, and Marling — Serving — Belaying — Fairleader — Belaying Pin — Toggle — Fender — Thimble — Mousing a Hook — Stropping a Block.

To give a complete account of all that can be done with cordage would, in fact, be to write a treatise on rigging, which is altogether outside our present purpose. But there are many ways of using rope for the construction of various articles in constant use aboard ship that every seaman has to acquire, several of which are of great service to landsmen and all those who have anything to do with cordage. Some of the principal of these we shall now consider. Seizing is fastening together two ropes, or different parts of the same rope, with several coils of small rope, spun-yarn, etc., laid on close together. There are several kinds of seizings which take their names from the positions they occupy in the rigging. End seizing is a round seizing at the end of a rope. Throat seizing is the first seizing clapped on where a rope or ropes cross each other. Middle seizing is between a throat and end seizing. Eye seizing is a round seizing next to an eye in the rope. To make a round seizing, make a small eye in the end of the seizing stuff, and, after taking a turn round both parts of the rope, reeve the ends through the eye, take two or three turns, and haul them taut with a marlinespike hitch; pass eight or ten turns close together, and heave taut. Bring the end back under these turns and out between the last two coils, and pass another series of turns on the top of the others, which are called riders, and are not hove so taut as the first turns. There is always one less of the riding turns than of the lower ones. Two cross turns are sometimes taken, passing between the ropes to be joined and across the whole of the seizing; the end is brought under the last turn, hove tight, and secured, if large, with a wall knot, crossed; if small, with an overhand knot, and cut off. Other seizings are done in the same way.

Sennit is a sort of flat rope, made by plaiting ropeyarn or spunyarn together, the outside yarns being brought over to the middle from each side alternately. It must always consist of an odd number of yarns, generally from five to thirteen.

French sennit is braided with an even number of yarns passed over and under every other time.

Gaskets are made of braided cordage in the same manner as sennit. They are used for confining the sails when furled to the yards. They are called arm gaskets when used at the ends of the yards. Bunt gaskets are used in the middle of the yard to hold the bunt of the sail, and quarter gaskets between the middle and extremities of the yards.

A Flemish eye (Fig. 119) is a method of making an eye without splicing. Unlay one strand at the end of a rope; bring the other two strands, just as they are, against the standing part, so as to form an eye of the size required. Lay up the strand which has been unlaid in the intervals in the rope from which it has been taken, only the reverse way—that is, you commence at the end and keep on laying it round until it comes down the standing part and lies along with the other strands. The ends are then tapered, marled down, and served over with small stuff.

An artificial eye is the end of a rope unlaid, and the yarns of which the strands are composed are separated. The yarns are now hitched round a piece of wood the size of the proposed eye. They are then marled, parcelled, and served over.

A grommet (Fig. 120) is a ring of rope made by carefully unlaying one strand from a rope and cutting it off. All the turns must be left in it. Form a ring by laying one part over the other, taking care that the turns coincide with one another. Pass one end round and round, in the lay, until all the intervals are filled up and the ring is complete. The two ends are secured as in a long splice, first with an overhand knot, and then by dividing the strands and passing half of them under the standing part, and cutting off the remainder. Grommets are used for stropping blocks, handles for chests, snorters for the heel of sprits, etc. They are very often parcelled and served to make them look neater. It is easier to make them if the rope from which the strands are taken is laid up hard.

Selvagee (Fig. 121) is a number of ropeyarns fastened together. To make it, drive two nails into a piece of board at a sufficient distance from one another to form the size of selvagee required. Wind ropeyarn round these to form the thickness you wish, and marl them down with spunyarn. They are used to form a neat stropping for blocks, or to go round a spar for fixing a hook to. Fig. 122 shows how a selvagee is employed for fastening a block to a rope. The middle of it is placed against the rope, and the bights passed one over the other, until they come close to the rope, when the hook of the block is inserted.

Worming is filling the intervals between the strands of a rope by laying spunyarn or other small stuff into them. This renders the rope more even and smooth for parcelling and serving. The first end of the worming is securely stopped and passed along one of the divisions of the rope. When it has been carried as far as it is required, it is stopped and laid back down another interval, and then forward along the remaining one, and stopped at the end. To estimate the quantity of serving stuff required for a given length of rope, multiply the length of rope to be served by the number of strands in the rope, and add one-third of the product. The result is the length of serving necessary to do the work. Thus, if six fathoms of three-strand rope have to be served—

Length	6	fathoms.
	3	strands.
	18	
	6	one-third.
	24	length of serving.

Fig. 123 shows at A how worming looks when finished.

Parcelling is done by winding strips of old canvas smoothly round a rope in spiral turns after it has been wormed and before it is served. This is shown at B (Fig. 123). The canvas is generally well tarred before it is used. To secure the canvas in its place it is marled down—that is, some marline or other small stuff is wound round it, which is secured at every turn with a hitch, so that each of the turns is secure and independent of each other. This is shown at B (Fig. 123). The proper hitch for securing the turns is given on a larger scale in Fig. 70 (page 361). In marling down, the coils are never laid close to one another, as in serving, but always at some distance apart. Fig. 124 shows the way a rope is served or covered with coils of spunyarn or other small stuff laid on quite close to one another. This is done with a serving mallet, as shown in the figure. The end of the yarn is first secured by placing it under the first two or three coils. The mallet, after being placed against the rope, has two or three turns passed round the body of it, and another turn or two on the handle. This produces sufficient friction to leave the coils taut as the mallet is worked round the rope by its handle. Another person is required for passing the ball of serving stuff. The service must be put on against the lay of the rope. A rope may be served single-handed by using a large reel for carrying the serving stuff, with a hole in its centre large enough for the rope to run through. This is kept just ahead of the mallet, and the serving stuff comes off the reel of its own accord as required. When the mallet is within a few turns of the end, the turns are taken off it by hand, the end is put through them, and heaved well taut.

Fig. 125 is the way a rope is belayed or made fast by cross turns round a cleat. The cleat is in this case supposed to be lashed to a stay or other rope, but it is often made fast to some part of the vessel.

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Occasionally a single hitch is put over the upper horn of the cleat, which makes the rope still more secure. It is often required to take a rope at right angles from one part of a vessel to another. This is done by means of a "fairleader" (Fig. 126). It is merely a block of wood with a hole in it of sufficient size to allow the line to run freely through it. The back of it is grooved to fit the rope it is lashed to. Where more than one line has to be led, a piece of board or plank with holes through it is used. A fairleader is not necessarily fastened to a rope, but is fixed in that position where it comes in handiest.

Fig. 127 shows a belaying pin with a rope made fast to it. This is the usual way of securing running rigging, as it is made fast and cast off so rapidly. Fig. 128 shows a method of securing ropes together by means of a toggle. This is a piece of wood turned to the shape shown in the figure. It has a groove in the centre, round which the end of a rope is spliced. An eye is made in another rope by any of the methods described and the toggle slipped into it. It can readily be undone by slackening the ropes and putting the toggle through the eye, end foremost. Fig. 129 is another form of toggle, a round piece of wood shaped like a button being used in this case. It has a hole in the centre, through which a rope is passed and the end knotted.

In running alongside a pier-head, or when boarding a vessel in a small boat, it is necessary to have something to protect the boat's sides from being chafed and the paint or varnish rubbed off. These are called fenders. They are occasionally made of wood, which is slung over the boat's side by a lanyard reeved through a hole in the end of it. More often they are made of canvas, stuffed with oakum and painted. Fig. 130 is an excellent form of fender, easily made, very effective, and needs no painting. Take a piece of Manilla rope double the length of the fender required; unlay it, and open the strands; comb them down until all the yarns lie straight; double it and clap an eye-seizing on it, marling it down as shown in the engraving. A lanyard of small cords, such as log-line, is then spliced into the eye, and it is ready for hanging over the boat's side. These fenders are very soft—"plum," as we call it in Cornwall—and last a long time. Fig. 131 is another and a handsomer form of boat's fender. This is made of a centre or "heart" of ropeyarn worked over or grafted with short pieces of ropeyarn called "knittles" or "nettles," which is in fact a species of weaving. The nettles are first cut to the right length, and the middle part slightly twisted. They are then brought snugly round a thimble, and a seizing put under it. The heart is put into its place and the nettles laid evenly over it. One-half of the nettles, taken alternately, are now turned back over the eye, the rest lying down the heart. Pass a turn or two of twine or marline, called the warp, or filling round the fender where the nettles separate, and hitch it. The nettles that are turned back must

Fig. 119.

Fig. 120.

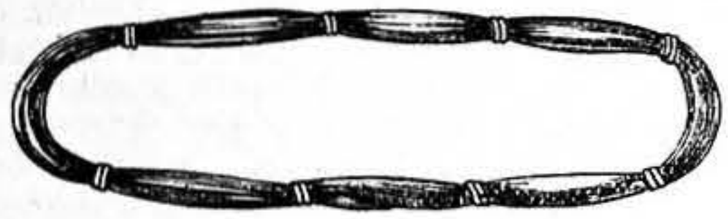


Fig. 121.

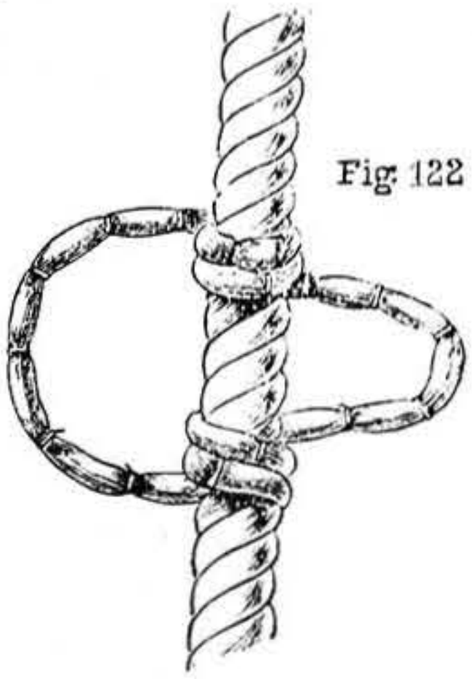
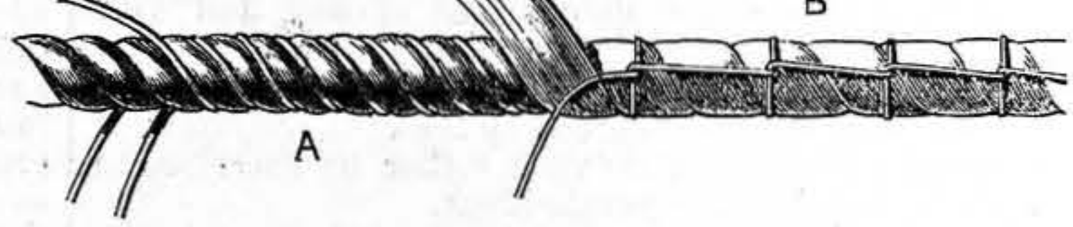


Fig. 122



B

A

Fig. 123.

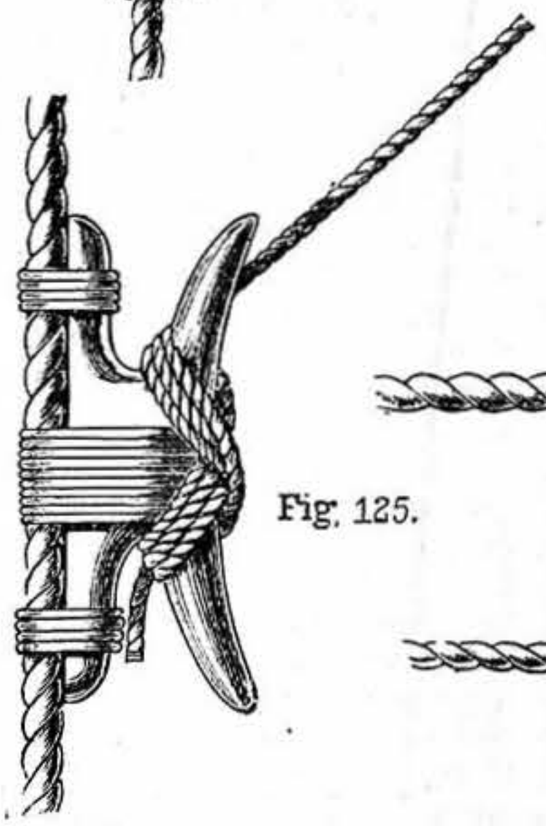


Fig. 125.

Fig. 128

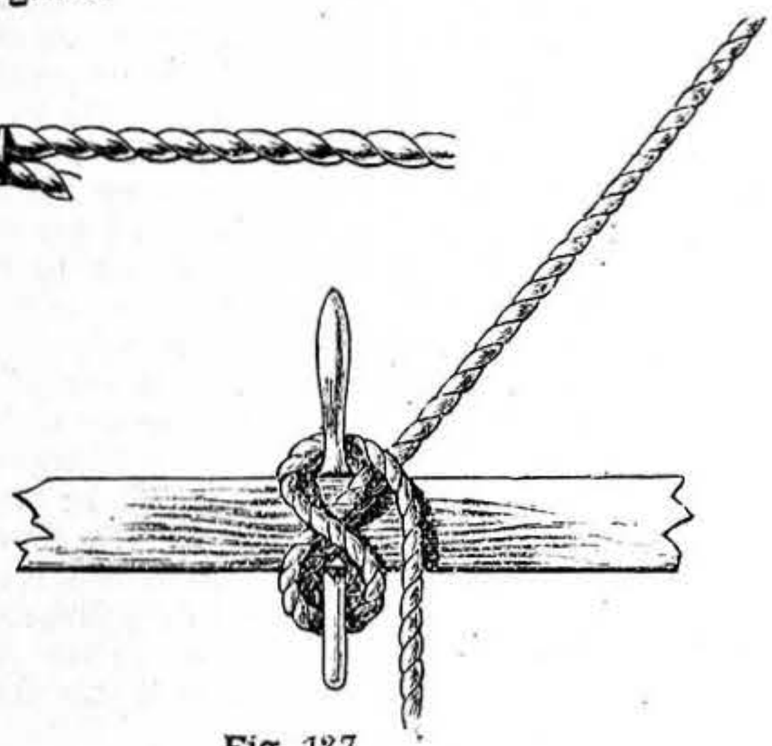


Fig. 127.

Fig. 124.

129

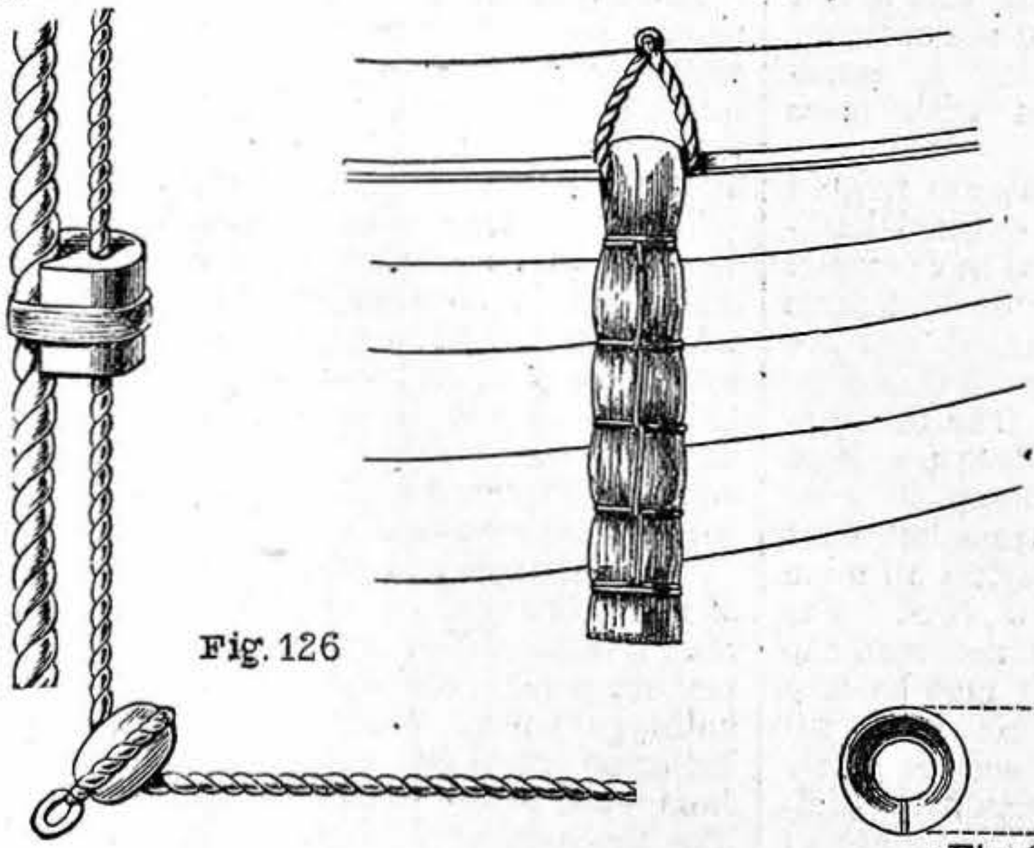


Fig. 126

Fig. 132.

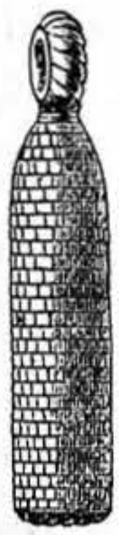


Fig. 131.

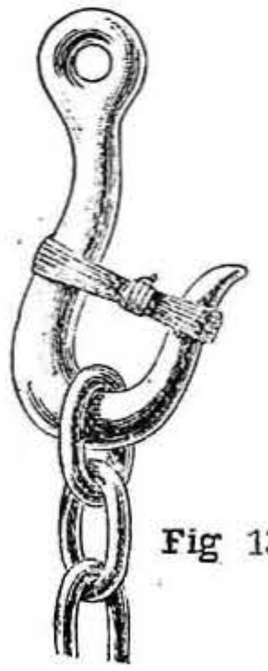


Fig 133

Fig. 134

Fig. 119.—Flemish Eye. Fig. 120.—Grommet. Fig. 121.—Selvagee. Fig. 122.—Selvagee fastening Block to Rope. Fig. 123.—Worming, Parcelling, and Marling. Fig. 124.—Serving. Fig. 125.—Belaying. Fig. 126.—Fairleader. Fig. 127.—Belaying Pin. Figs. 128, 129.—Toggle. Figs. 130, 131.—Fender. Fig. 132.—Thimble. Fig. 133.—Mousing a Hook. Fig. 134.—Stropping a Block.

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now be brought down, and the ones that are down turned up over the eye. The warp is now passed again, and hitched as before. This must be repeated until the whole of the fender is covered with a sort of woven coat as in the engraving. The ends of the nettles are brought round the last turn of the warp, and interlaced in the grafting. This fender requires a lanyard the same as the last one.

A thimble (Fig. 132), side view and in section, is a ring of iron, usually galvanised, with a hollow formed round it, so that a rope or strop may fit snugly into it. They vary in shape, some being heart-shaped and some round, as in the engraving. They are very much used when a small eye is wanted at the end of a rope for another rope to pass through. Fig. 133 is a method of preventing a chain slipping off a hook, which it would have a great tendency to do when, as often happens, it is dragged along the ground or deck. A few turns of ropeyarn are passed round the end of the hook and the standing part, and the ends brought round the middle a few times, and fastened with a reef-knot. This is called "mousing a hook." For "stropping a block" (Fig. 134), a grommet or selvagee is often used. Sometimes the stropping is made by splicing the ends of a suitable length of rope together. A grommet, however, is neater, and a selvagee the neatest of all, particularly when it is covered with leather. The block is first fixed in one bight, so that the lower part of the block sits on the splice, if there is one. A thimble is put into the other bight, and a seizing put on between the block and the thimble, each turn of which is hove taut with a heaver. The turns are, lastly, crossed, and the ends knotted. Fig. 134 shows the work finished.

IMPROVEMENTS IN KALLITYPE.

BY L. IVOR POOLE.

INCREASED SIMPLICITY—CLEANLINESS—MATERIALS FOR DEVELOPMENT—VARIETY OF TONE—EXPOSURE—DEVELOPMENT—FIXING—WASHING—ALBUMEN KALLITYPE.

A SHORT time ago I had the pleasure of directing the attention of readers of WORK to the photographic printing process known as Kallitype. Since the article referred to, the proprietors of kallitype have made important progress with their prepared paper, the improvements being of such a radical kind that, as now practised, the process may almost be said to be a new one. The principal reason for the new departure may be stated to consist in the increased simplicity of development, or rather, in the ingredients of the developing solutions. Those who practised the old or original kallitype will remember that, though admirable in its simplicity, and inexpensive, there was great danger of staining the fingers while manipulating the prints. This is now done away, and the process is as cleanly as the most particular could desire. The materials for developing are also cheaper than formerly.

The new paper is known as "Kallitype No. 2," and, like the older form, has a matt surface. Indeed, when developed, the prints look exactly the same as by the older process.

The developing materials are Rochelle salt, borax, and a very small quantity of bichromate of potash; so that it will be seen they are very easily obtainable.

The Rochelle salt—or, as it is called under its scientific name, tartrate of soda and potash—will be familiar to many as a component of seidlitz powders, so that it may be gathered it is obtainable at an ordinary chemist's. It is very cheap.

Borax is too well known to require any remarks, beyond saying that the ordinary commercial kind does very well for kallitypy. On the proportion used along with the Rochelle salt the colour of the prints depends.

The developer recommended for black kallitype prints consists of 1 oz. Rochelle salt, ¾ oz. borax, 10 oz. water, and from 10 to 12 minims of a solution of 20 grains bichromate of potash in water.

By diminishing the above-named quantity of borax to 2 drachms purple tones are obtained, and personally these are more unpleasant to use than the former. That, however, is a matter of taste on which each can please himself, as either the black or purple can be obtained at will, and with equal ease. I presume no one will imagine that the purple alluded to is a bright colour, such as is obtained by the blue or cyanotype process, for it might rather be described to a novice as purple-black.

By omitting the borax, and reducing the Rochelle salt to ½ oz. in 10 oz. water, sepia or brown tones are obtained. When this is desired, half the quantity of bichromate solution, or 6 minims to the 10 oz. of water, is recommended. Many of the sepia-coloured prints are very beautiful, but from some reason, which I am unable to explain, I find it more difficult to produce them with certainty to the same tone. This simply amounts to saying that rather more care is required in the printing.

An earlier formula for producing sepia tones was as follows:—Rochelle salt, ½ oz.; borax, 1 drachm; strong hydrochloric acid, 5 drops; water, 10 oz.; and 10 minims of the bichromate solution. With this also I got some very fine results; but the ordinary formula as given above, being so much simpler, will no doubt meet with more favour.

The prints, of whatever tone, are treated much as if they were on the original kallitype paper. They are exposed in the usual manner till the details in the densest parts of the negative are fairly indicated, and are then kept in the dark and dry till it may be convenient to develop them. The development, if the prints, meantime, are kept from exposure to light or damp, may be deferred for any reasonable time, but what the limit is I am unable to say, as all mine have been done within a few days. For the benefit of those who did not read the former article on Kallitype, it may be said that the prints do not appear fully till development. As the image becomes partly visible, however, there is very little difficulty in determining the right amount of exposure after a short experience. The paper, it may be added, is more sensitive than the ordinary sensitised albumenised kind used for silver prints, but not so much so as bromide paper or any of those used for enlargements or reproduction by artificial light. Owing to its sensitiveness, it should only be handled in a very subdued daylight or by artificial light, but not necessarily that of the dark room.

Over-exposure merely causes too great an amount of blackness in the picture, analogous to the blackening of an over-exposed plate in the camera, while under-printing, of course, gives a weak picture.

When ready, the prints are immersed in one or other of the developers. The print immediately appears, but does not attain its full density for a few minutes. The time considered requisite for full development of a perfect print is stated to be half an hour, but I have found it sometimes an advantage to remove the prints sooner.

It should be noted that if the prints are removed too soon from the developing bath, the yellow tint which is observable will not entirely be removed, as it should be, during the subsequent fixing. On the other hand, if they are left too long in the developer, yellow stains may show on the finished print.

A large number of prints may be developed at the same time, but they should be kept moving, as when toning ordinary silver prints; and the same developer may be used repeatedly if it is kept from the action of light. It is said that 10 oz. of developer will serve for five or six dozen half-plate prints, or, say, a gross of quarter-plate size. In practice, however, I have not been able to accomplish this, or, to be more explicit, have not tried, as, in accordance with the instructions issued with the paper, I have preferred to use plenty of developer. It is so cheap and easily made, that it is better to do so than to run the risk of spoiling prints by using old stuff. A very considerable number of prints, however, may be developed in the same solution without apparent deterioration.

The fixing and clearing, or elimination of the yellow colour, is effected by means of a bath consisting of 4 drachms of the ordinary strong liquid ammonia (·880) in a quart of water—or, say, 1 drachm to a tumblerful. In this the prints should be kept moving for about a quarter of an hour. They may then be washed, but it is recommended that they should be treated in a second fixing bath of the same proportions as the first. This ensures perfect fixing.

After treatment in the fixing bath, they should be well washed, either in running water or in frequent changes, for about a quarter of an hour, though if left in for longer no harm results. They are then finished, and only require to be dried and mounted.

Toning, in the ordinary sense, is unnecessary, as this is done during development, and there is no troublesome washing, as with silver prints, to get rid of the baneful hypo.; so that, on these two grounds alone, kallitype should become a favourite process, especially with those who cannot devote much time to photography, but wish to get finished results as quickly as possible.

There are many to whom the glazed finish of the ordinary silver print is more pleasing than a matt surface, and to meet them, the manufacturers are now issuing albumen kallitype paper. When done on this, the kallitype prints are scarcely distinguishable from good silver prints, without anything like the amount of trouble which there is in producing them. As has been shown, they can be had in almost any tone, including the purple-black which so many amateurs seem to vainly strive to get in silver prints.

Although three formulæ are given for black, purple, and sepia tones respectively, it does not follow that these must be kept closely to; for by carefully altering the various proportions I believe any desired tone—within the range of those given as the extremes, of course—can be got to the utmost nicety. On one occasion, when away in the country, and a long distance from any chemist's where I could obtain developing materials, I developed a batch of prints with a mixture of purple and sepia tone developers. The tone of these is certainly not

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inferior to that of any of the others, so that it will be seen no great exactitude is necessary in mixing the developers. The chief point with them is not to use too much of the bichromate solution. This gives greater contrast between high lights and deep shadows, but if used in excess, destroys the half-tones on which so much of the beauty of a photograph depends.

Finally, it may be stated that kallitype prints are considered permanent; and I think that if readers of WORK will try the process they will be, like myself, delighted with its economy, simplicity, and rapidity, as well as with the results.

SOME LESSONS IN WINDOW MAKING.

BY G. LE BRUN.

DOUBLE-HUNG SASHES: A FEW NOTES ON THEIR CONSTRUCTION.

DOUBLE-HUNG sashes are so common, and in such general use in this country, that there is scarcely a carpenter's shop of any pretension in which they are not made. But, although this class of window is so common, there are several ways of constructing the framing that is in use in different localities, and even in different shops in the same town, which, although differing in details, have the same end in view—viz., the production of a well-fitting, weather-resisting window that admits of being easily opened and shut. The construction of the building in which the windows are to find a final resting-place often to some extent influences the details of the window case: thus, varying thicknesses of walls, the use of stone or brick, and the kind of inside finishing to be used, either with or without shutters, all affect in a slight degree the various details to be considered in the making of the framing that is to contain the sashes. Added to this, practical workmen differ greatly as to the best modes of doing the work, one man thinking that his particular way is the best to the exclusion of all other ways, forgetting that if the result be a perfectly finished piece of work, without unnecessary expenditure of time, one way is as good as another.

It has of late become the practice in large towns to use to a great extent, especially in cheap or "jerry" work, a good deal of Swedish wood, which can be purchased at the woodyard ready for framing together; thus we find stuff for sash framing, sash bars, sills, sash and parting beads, ready to the hand of the builder who desires to minimise the cost of labour, and who can buy the said stuff in lengths to suit. I am not in favour of this mode of working, however cheap it may be, and in the course of this paper will adhere to the good old-fashioned way of working all the material required out of the rough. Various woods are used for the purpose of window making, from white pine to oak or mahogany. Perhaps the best woods to use, and the commonest for good work, are either red pine or pitch pine—preferably the latter, from its good standing qualities. The inner facings (or linings, as they are sometimes called) may be of yellow deal.

A hung window, when finished, presents the appearance shown in Fig. 1, and to proceed with the construction of it, we must get out our wood. Let us say, for example's sake, that the opening which we have to fit our window to is 6 ft. by 3 ft. "daylight"—that is, exclusive of the rebates: we will then want a sill 3 ft. 9 in. long, 7½ in. wide, and 3½ in. thick at one edge, tapering down to about 1 in. at the other. A section of this sole in the rough is shown at Fig. 2, and it must be worked into the shape shown in section in Fig. 3. The groove shown on the under-side is to assist in holding the bedding of cement it will get when put in its place, so as prevent rain water being driven underneath by the force of strong winds; the groove on the inside edge is for the insertion of the edge of the inside finishing piece, although in many cases this will have to be omitted. The bead run on the top of the inner edge is ⅝ in. When the sole is worked out to section, it is best to make a mould of thin wood that can be applied to each end of the sole, and draw on it with a pencil; this will ensure their being all alike, and greatly facilitate matters when you come to fit your sashes in the case. This especially when you have more than one window to make.

The next piece is the lintel; this will be of the same length as the sole—6¾ in. wide and 1½ in. thick. A groove, ¼ in. deep, is run on the under-side, 2¼ in. from the outside edge, for the reception of the parting bead; this groove is $\frac{9}{16}$ in. wide. This groove is shown in Fig. 4, which is a section of the lintel, complete, showing sash bead, parting bead, and outside facing in position. A groove is sometimes run in the inner edge to receive the edge of the finishing board, as previously described in connection with the working of the sole.

There are, as I have previously mentioned, different methods of constructing the sides of the window case. Of these methods one of the simplest is that shown at Fig. 5, and we will follow it in the construction of our window. At the same time, as it is always well to know different ways of doing the same thing, two other methods are also shown in Figs. 6 and 7, in which the principal difference is that they are so framed up that the weights (w) are enclosed in wooden boxes. Whether or not this is an advantage is pretty much a matter of opinion. Personally, I do not see much advantage in thus boxing the weights, and in practice have never found that weights, when unboxed, were liable to entangle their cords. Still, these extra parts serve to stiffen the window case, if nothing else, and in some localities are very generally adopted.

The pulley stiles for our case are cut out of 1 in. stuff, and are planed up true on one side and both edges, being gauged to a width of 5¾ in.; their length (in the rough before cutting to size) is 6 ft. 1 in. Groove them from the outer edge for the reception of the parting bead with the same plough as used for the lintel. A pair of inside linings (or facings, as they are sometimes called), 6 ft. 3 in. long and 5 in. wide, of ⅞ in. stuff, and a pair of outside linings of the same length, 3 in. wide and ⅝ in. thick, are also required. A ⅝ in. bead is now run along one edge of the outside linings, and also on the edge of a similar piece, 3 ft. 1 in. long, which is to be nailed on the outer edge of the lintel, A (Fig. 4).

Take a piece of stuff, 6 ft. long and ⅝ in. thick, free from knots, run a cutting gauge, set to 1 in., along both sides, then run your ⅝ in. bead-plane along the edge, break off the piece, and you have one parting bead; make another, also a piece for the lintel: then shift the cutting gauge to 1½ in., and run off the sash beads (sometimes called bâton rods) in a similar manner. If you do not possess a cutting gauge, a rip saw can be used, but a gauge is the proper tool, as it is a great saver of time. Plane up the rough edges of the parting beads, but leave those of the sash beads until you come to fit the sashes to the case.

The wood thus all prepared, the setting out of the case may be proceeded with. We begin with the sill: lay it on the bench and measure off 3 ft. in the centre, leaving an equal length of wood at each end. Mark and square across the upper side and inside edge, and cut down with the tenon saw to within ⅞ in. of the bottom of the sill; make two other cuts to the outside of the first, and on the angle, the distance from the first cuts being about 1½ in. at the inside edge, and 2 in. at the outside edge, of the sill, so as to give room for driving a wedge behind the pulley stile when fitting together: then off the inside edge of the stumps cut away the thickness of the inside facing. These cuts are shown in Fig. 8 (A, A), in which the finished sole is shown.

The lintel of the case is set out to the size in a similar manner (Fig. 8A), and is cut away like the sole for the reception of the facings.

The pulley stiles are cut ½ in. shorter than the "daylight" of the brick or stone opening, which in this case is 6 ft., so their exact length will be 5 ft. 11½ in. By referring to Fig. 9, the mode of cutting the pocket-hole for the insertion of the sash weights will be seen. Pocket-holes differ in length according to the size and weight of the sashes. Thus, a sash glazed with plate-glass weighs heavier than one glazed with sheet, and so requires larger and heavier weights; therefore the pockets must be cut to suit. This is, however, a matter of detail, and it will be sufficient for our purpose if we make the pockets of the case we are working upon of a medium size—say, the lower end about 9 in. from the case sole, and the pocket itself about 1 ft. 6 in. long. In the figure you will notice that one end is cut at an angle; this is the top end. Cut from both sides of the stile, a trifle more than half-way through, with a finely set dovetail saw, bore two holes with a small centre-bit in the middle of the groove of the stile (Fig. 9, A A), and rip down between them, using a port saw to commence the cut. Do not knock out the pieces just at present; that is done in putting the case together.

The insertion of the pulleys in the stile next claims our attention. They should be put in about 4 or 5 in. from the top end, and in the centre of each sash run, being sunk flush with the wood, and carefully fitted in, as if they do not fit well and firmly, they will work loose in time with the working up and down of the sashes. See also that when fitted the wheel runs easily and does not jam. When many cases of the same kind are being made, it is usual to make a mould with two square holes in it, so that, when applied to the top of the pulley stile, the holes can be marked round with a pencil, and thus show where to cut away without measuring. This mould ought to have a piece of wood nailed along one side and end to serve as a guide, or fence, in applying it to the stile.

The various parts of the case being now ready for putting together, take the inside facing and nail them on to the inside edge of the pulley stiles, taking care not to nail the pocket piece, which, if done, would cause much profanity when you came to knock it out. These facings are not as yet cut to length; that is done in finishing the case. Lay the stiles on the bench, the facing over

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the edge, and clean off with a fine-set hand plane.

To put the case together, clear the tools off the bench, and lay across it two pieces of wood rather longer than the case is wide, and of any reasonable width and thickness—about 5 in. by 2 in. is a fairly suitable size. Lay on these pieces the stiles, facings downwards, then place the sill and lintel in position, and fix them so with wedges driven in behind the stiles as shown in Fig. 10, A being the wedge. When firmly wedged, and the joints quite close, secure the case further by nailing the sill and lintel firmly to the stiles with 3 in. nails. The outside edge of the case is now uppermost as it lies on the bench, so before turning it over put on the outside facings, first making sure that the case is perfectly square by trying it diagonally with a pointed rod. The lintel facing is put on first, and allowed to project inwards $\frac{5}{8}$ in.; the side facings are then fitted on and nailed firmly. These facings are sometimes mitred at the corners for the round of the bead, and just as often the side facings are fitted to the lintel facing with a gauge. The case is now turned over, and if the joints on the inside are not perfectly close, a cramp is applied, and the inside facings nailed firmly to the stumps of the sill and lintel. With a smart blow from a hammer behind the bottom ends of the pocket pieces, they are knocked clean out, then replaced in position, and the parting beads fitted in, the lintel piece being put on first, and nailed. The side beads are not nailed, and must fit tightly in the groove, the lower end being cut so as to fit the bevel of the sole, and having a small tenon that will slip down behind the end of the sole and into the groove. The top ends are fitted to the lintel bead with a gouge. The sash beads are now put in, lintel first, as before; then the side beads. The lintel bead is nailed, and is stripped to the proper width before being put on; the side beads are not stripped to width until the sashes are fitted in: they are temporarily held in place by a fine brad driven half way in. Fig 11 shows mode of mitring the corners of these sash beads.

The inside facings, sill, and lintel are now finished off with hand-plane and sandpaper, the stumps of the linings cut off, and the case is finished and ready for the sashes. In many shops a pair of trestles are used for laying the case on while putting together, instead of using the bench for that purpose, but that is a mere detail.

The making of the sashes comes next, and as all the practical details of an ordinary sash have been described in a previous paper, it will be sufficient to call attention to a few points to be attended to in the making of sashes that are hung, the principal difference from the sashes described being the "meeting bars," "chess bars," or "countercheck bars," as the top and bottom sash rails that meet in the centre of the window are called: they have a host of other *aliases* besides these terms, but for our present purpose we will call them the "meeting bars"—it is quite as sensible a term as any of the others. These meeting bars, then, seem often to be the bugbears of the aspiring young carpenter: he is troubled in his mind about them when he gets a hung sash to make, and their perplexities cause him sleepless nights. Why this should be so is a mystery, for a little thought over them ought to be sufficient to clear the brain, and enable it to comprehend their intricacies.

Fig. 12 shows a section of the case and sashes. To set out the sashes accurately, cut a rod the exact length between the lintel and the part of the case-sole where the bottom of the sash-sole will come when fitted—that is, close to the foot of the parting bead. Set out on the rod the width of the sash-sole, say $3\frac{1}{2}$ in., and that of the top rail of the upper sash, say $2\frac{1}{2}$ in.; divide the space between these into two equal parts (sometimes the upper sash is made shorter than the lower), and set out there the meeting bars, $1\frac{1}{2}$ in. This now gives the length of the sashes, the lower one being from the bottom end of the rod to the *upper* side of the meeting bars; the upper one, from the top end of the rod to the *lower* side of the meeting bars. These lengths are shown by the dotted lines outside Fig. 12. In Figs. 13 and 14 the mode of tenoning and rebating

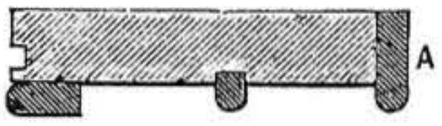
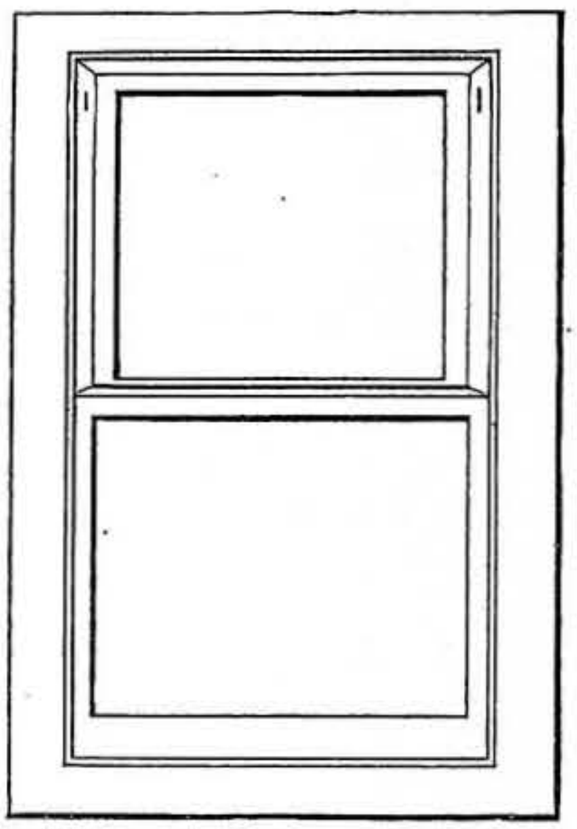


Fig. 4.



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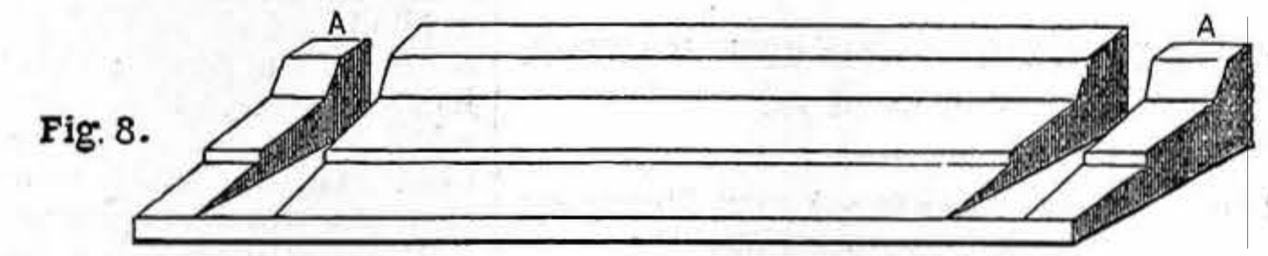

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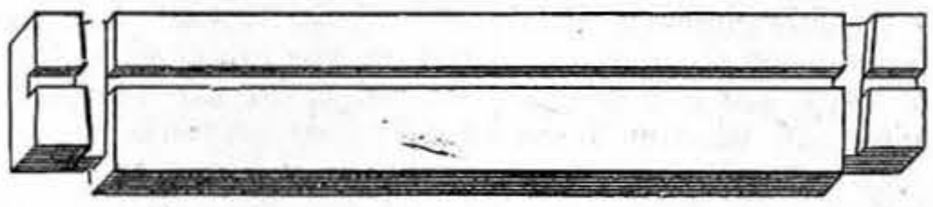
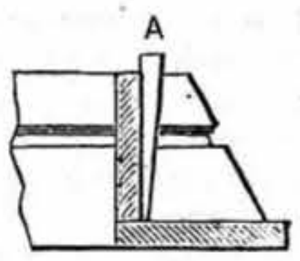


Fig. 8A.



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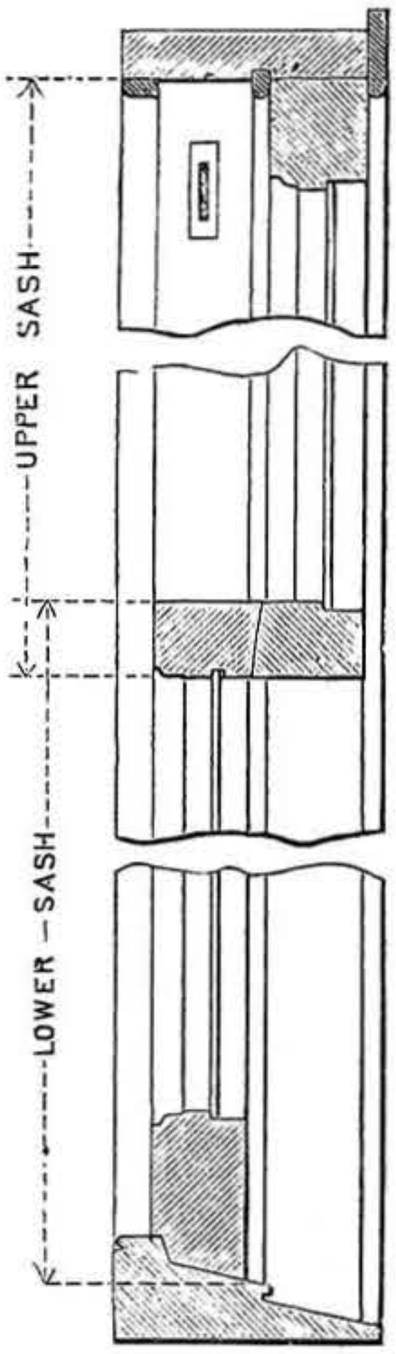
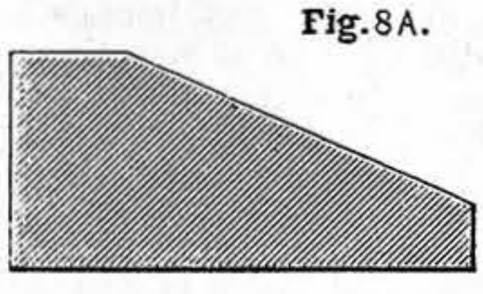


Fig 12.



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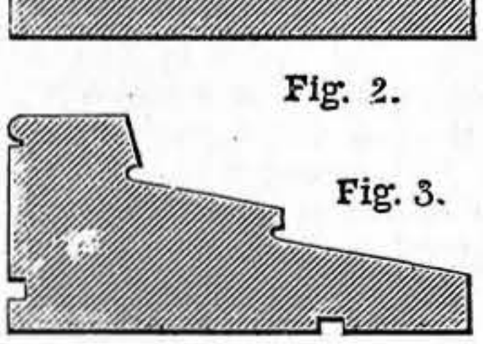

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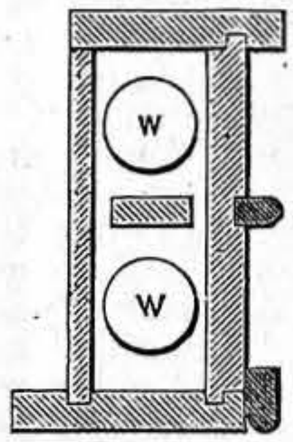

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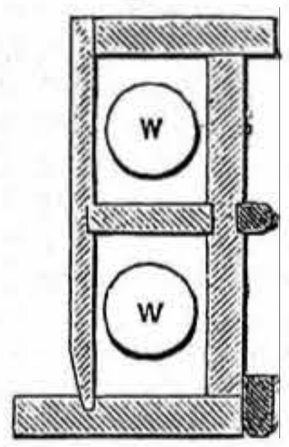

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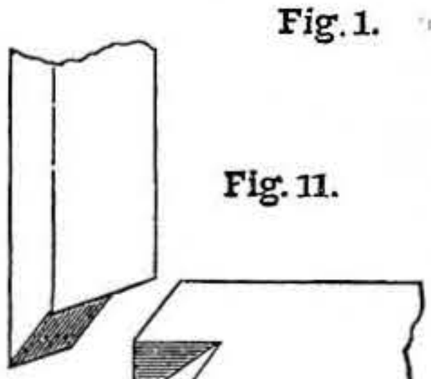

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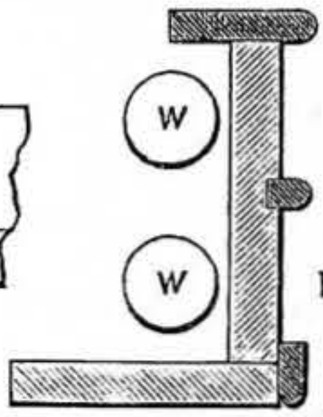
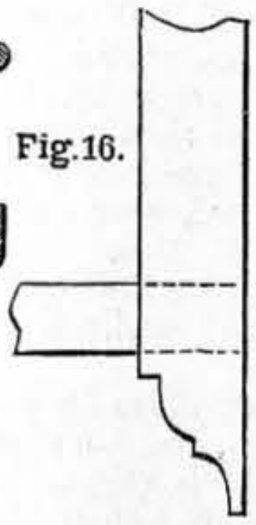


Fig. 5.



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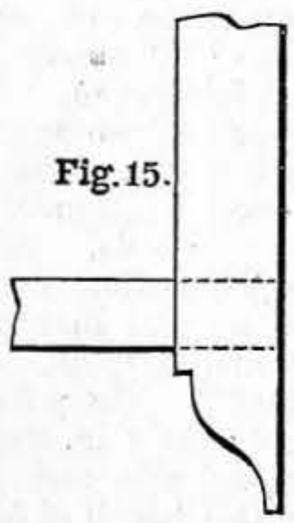

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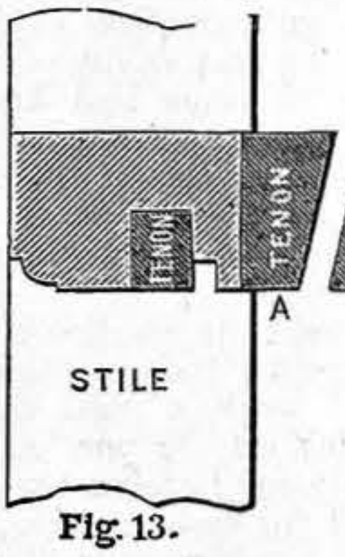
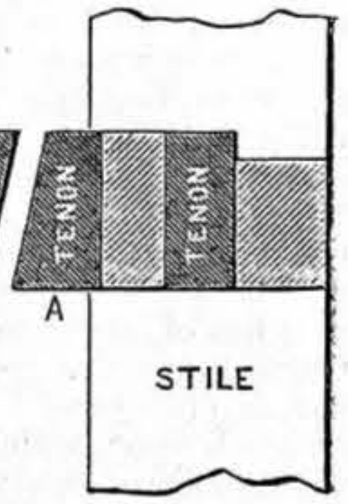


Fig. 13.



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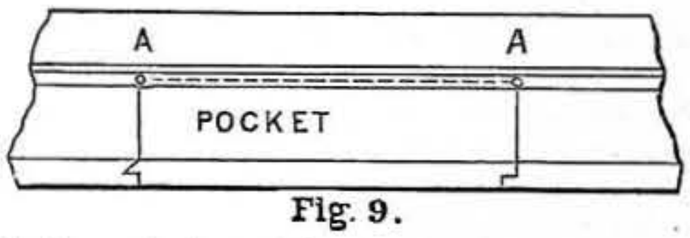

Fig. 9.

Fig. 1.—Elevation of Case with Hung Sashes. Fig. 2.—Section of Case Sill in the rough. Fig. 3.—Section of Finished Sill. Fig. 4.—Section of Lintel. Figs. 5, 6, and 7.—Sections showing Alternative Methods of framing Sides of Cases. Fig. 8.—Sill, prepared to receive Pulley Stiles and Linings. Fig. 8A.—Lintel, showing Grooving and Rebating. Fig. 9.—Method of cutting Pocket Pieces. Fig. 10.—Method of wedging up Pulley Stiles. Fig. 11.—Mode of mitring Sash Beads. Fig. 12.—Section of Case with Sashes. Figs. 13 and 14.—Sections of Upper and Lower Meeting Bars. Figs. 15 and 16.—Alternative Mouldings for Stumps of Upper Sash.

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the meeting bars is shown, Fig. 13 being the bar of the lower sash, in which it will be seen that instead of a rebate for the glass, there is a groove run (the reason for which will be obvious), and that the tenon going through the stile is only half the width of that in the upper bar. This is because a moulded stump is generally left on the upper sash, while that of the lower being cut off, the tenon, of course, must be smaller accordingly. Sometimes, in good work, the stump is also left on the lower sash, and in that case the tenon can be the full width. Two alternative shapes for these stumps are given at Figs. 15 and 16. Fig. 14 shows the upper bar, in which there is only the rebate for the glass run, no moulding being required. Besides the ordinary tenons on these two bars, the extra width of them allows of an additional tenon, as shown at A A in the figures. There is a piece about ⅛ in. cut out of the stile to allow of greater steadiness to these tenons, as also shown.

In getting out the wood for these meeting bars, ½ in. wider than the thickness of the sash stuff should be allowed, and one edge only should be planed up, the other being left rough until they are fitted. I think these few explanations should be of sufficient assistance to those who have studied the previous paper, and should enable them to grasp the various details, all the setting out of the rails, the mortising, moulding, and rebating having been there thoroughly gone into.

When the sashes are made and finished off, there remains the job of fitting them to the case. To do this, proceed as follows: Place the case on end against the wall of the workshop, and try if it is quite square by means of the sash beads, which you will take out, applying them from corner to corner. If not square, you must get it so by squeezing the long corner a little, and when right keep it so by means of a piece of wood nailed diagonally across the case on the outer side. Of course, you will keep the inside of the case towards you. Cut off the stumps of the lower sash stiles, and bevel away the lower edge of the sill rail to fit the case sill, using a skew plane to form the inside rebate. Make a good fit, as an ill-fitted sole is an abomination. When fitted, plane up the top of the meeting bar, then putting the sash in its place, measure with a rod the distance from the lintel to the *under* side of the meeting bar: take the distance at both sides of the case, as there might, from some cause or other, be a slight difference. Apply the rod to the upper sash, the end flush with the *under* side of the meeting bar; mark off the height on each stile and strip up to size. The meeting bars are now bevelled, to fit tight against each other, in the way shown in Fig. 12. Sometimes a special plane is used for this purpose that forms a double rebate and prevents the opening of the sash fastener by means of the insertion of a knife from the outside, a mode of entrance that is familiar to the enterprising burglar; but the common way is a simple bevel joint as shown. Of course, it will be apparent that space for the parting bead to work in must be cut from the ends of the bars. The sashes when fitted should not have too much "play" sideways—not more than $\frac{1}{16}$ in. each side. After the fitting is completed, grooves must be run in the outer edges of the stiles for the reception of the cords, using a ½ in. plough-iron, and making the grooves ½ in. deep. Run these grooves from the top edges of the sashes, and fully half-way down the stiles. The sash beads can now be stripped up to the proper width, which can be found by putting them in place and sliding the lower sash up and down, allowing, of course, a little clearance. If you have more than one window in hand at one time, the sashes must be numbered so that they may be put in their proper places when glazed. The numbering is generally done with a ½ in. chisel, Roman numerals being used, and the numbering done on the bevel of the meeting bars, and behind one of the sash beads of the case, in this fashion —IX.

I have thus given a few necessarily short hints to the novice, and trust they may be useful in aiding him a little in the mysteries of hung sashes, and again remind him that there are many and various ways of working, as well as the way described, and advise him to get on friendly terms with the older hands in his shop; they will, if properly drawn out, give him many a wrinkle, and teach him more by verbal explanation than he can ever hope to learn from a short paper like this, however clearly it may be written.

I need scarcely add that the mode of constructing the case sides shown in Figs. 6 and 7 demands slightly different treatment of the ends of the case sole and lintel; but the difference is of such a nature that the proper treatment will suggest itself to the intelligent workman.

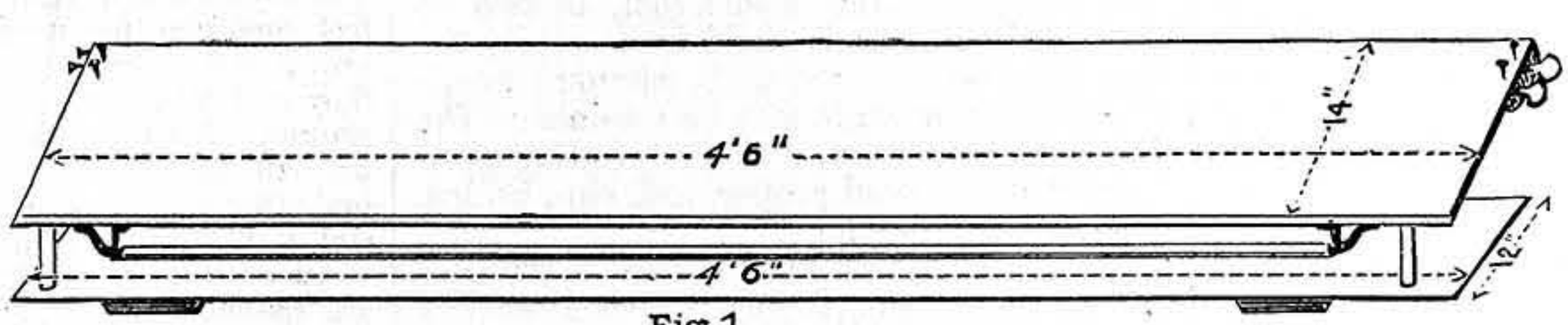
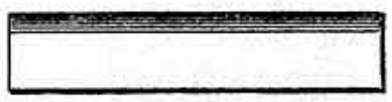


Fig. 1.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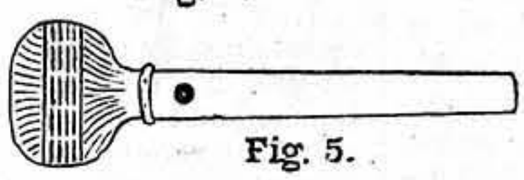
Fig. 5.

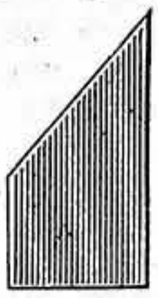
Fig. 12.

Fig. 3.

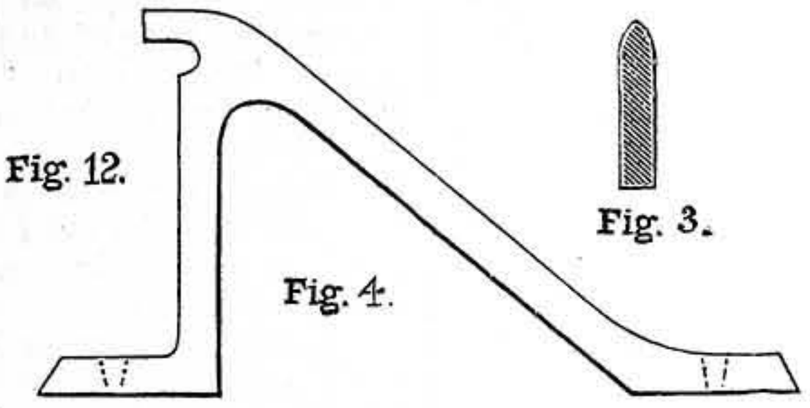
Fig. 4.

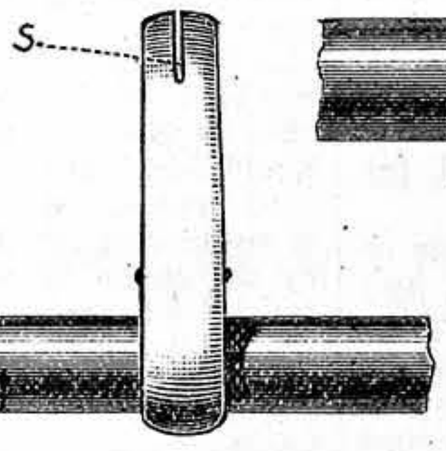
Fig. 8

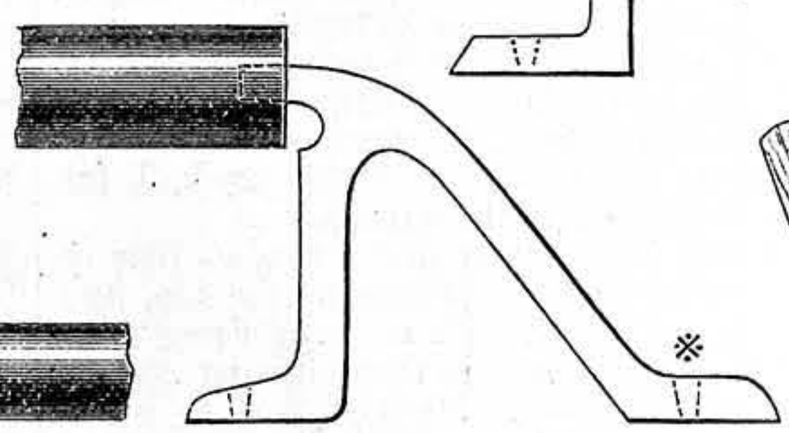
Fig. 9.

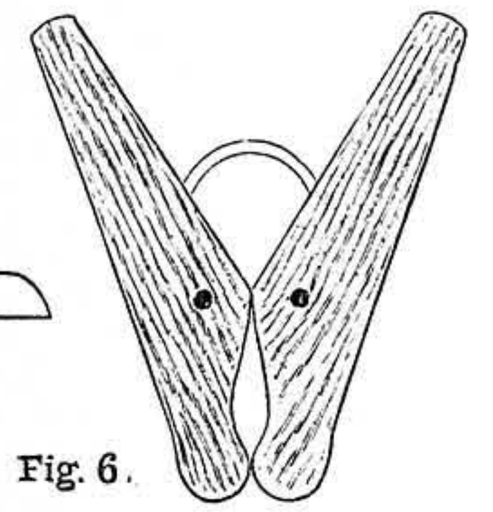
Fig. 6.

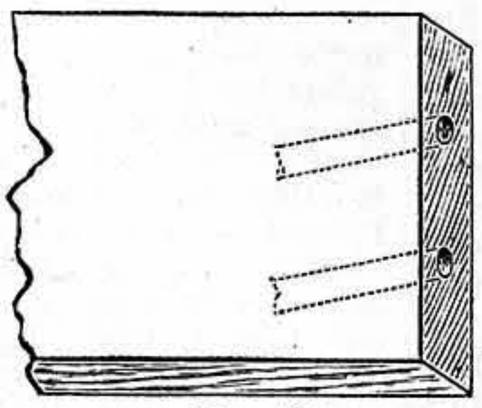
Fig. 10

Fig. 11

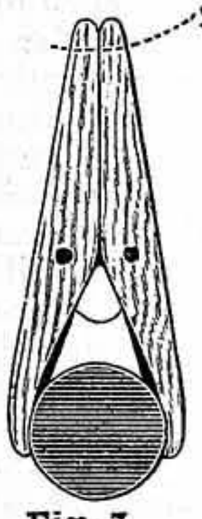

Fig. 7

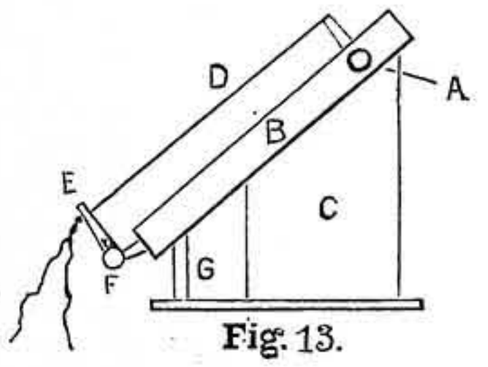

Fig. 13.

Fig. 1.—Frame fitted on Baseboard with Rod in Position. Fig. 2.—Bridge. Fig. 3.—Section of Bridge. Fig. 4.—Bracket. Fig. 5.—Peg. Fig. 6.—Ordinary American Wood Clothes-Peg or Clip as bought. Fig. 7.—Clip filed up, showing how it grips Rod. Fig. 8.—Elevation of Clip, showing how it grips and slides on Rod. Fig. 9.—How Brackets hold Rod. Fig. 10.—Peg-Block. Fig. 11.—Pillar for Front. Fig. 12.—Bracket for Back. Fig. 13.—Diagram showing how Cord is held in Saw Kerf in the Clip—A, Peg; B, Board; C, Back Bracket; D, Cords; E, Clip; F, Rod; G, Front Pillar.

AN EASILY-MADE MACRAMÈ BOARD.

BY PASQUIN.

By reason of its virtually everlasting qualities, macramè lace is always likely to be popular; hence there are probably many persons who would practise this elegant and fascinating art were a really good and easily contrived frame or board to be had at a reasonable price. The one herein described can readily be made by anyone who can handle tools, while the cost is a mere nothing. It is simple in its construction, and possesses many features likely to recommend it to already skilled workers in macramè, two of the principal of which are —the ease with which the foundation cords may be strained taut and kept so, and the simple but effective contrivance for holding the strings for certain stitches. "Solomon's knot" is a case in point. In this stitch it is almost imperative that some such contrivance is available. Some persons loop the two strings which form the basis of the "bar" (and upon which the stitch is worked) through the vest buttonhole, but this is obviously a makeshift arrangement, as the body must be held rigid, or the cords are slackened. In page 430, "C. E. M." gives us an arrangement designed with the same object, but although he succeeds in holding the strings fast enough, they are level with the board, and are consequently awkward

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to get round. Further, his contrivance requires opening and shutting, or the use of both hands, whereas in the one I am about to describe, a single simple motion of the hand, as in laying down the cords in question, is all that is required; while they are rigidly and firmly held in any position, and as far from, or as near to, the board as may be deemed desirable. The board I made was of inch stuff, and has since been put to other uses; hence I am unable to furnish exact dimensions, nor does this matter, as very few are likely to attempt a piece of work over six or eight feet in length, and such a piece could be comfortably worked on the size I have here given. As for width of the board, that is really immaterial—any width sufficient to include all the foundation cords will do. However, I have given the dimensions of the one I first made, as nearly as I can remember them. Take, therefore, a piece of inch board, planed up on each side, and of any approved size. First, by means of good paste, cover one side with clean brown paper. This is convenient in several ways: it allows of marking out distances, etc., and also serves to keep delicate coloured string clean. I first mapped out the face of my board into squares of an inch, and at the intersection of the lines I bored holes to receive pins, made from cheap button hooks, with the hook filed off. These I expected would be of service in working deep designs, but beyond utilising such pins and holes to hold work out of the way, I never made much use of them. Probably, however, one line of such holes, at about a third of the way up, would still be found useful, and two such pins as those described would be plenty. Having got out your board proper, proceed to make a base or stand, which may be of half-inch stuff, but must have a stay or cleat screwed on at each end, or nearly; this not only prevents warping, but also serves to keep the appliance steady on the table when in use. Get a piece of old broomstick, and cut two such pillars as are shown in Fig 11, taking care to have the bevel the same in each. These support the board in front, as shown in Fig. 1, while a plain bracket, cut as Fig. 12, supports it at the back. Two such may be used if desired, but one is quite enough to secure stability. Now before putting up the board, affix a stout piece to the right-hand end, to serve as a peg-block. Fig. 10 shows such a block, which may be made the full width of board, if desired, but in practice, I found that only the first two foundation cords required to be perfectly taut; all others can take care of themselves. Bore the peg-block to receive a couple of ordinary 'cello pegs, and at the corresponding part of the other, or left-hand end of board, insert two screws, or even wire nails, to serve as "hitch pins." But even with all the force obtainable from the pegs, the foundation cords will still be far too slack; besides which, they are level with and touching the board. Therefore we make use of two bridges, such as Fig. 2, one at each end. These are carefully raised *after* the foundation strings have been well strained, and you will find the latter become as taut as wire, and remain so for any reasonable time. Next, procure two common cast- (or malleable) iron blind brackets, such as are shown in Fig. 4. These, I believe, are of American make, and are to be had of any ironmonger. Fig. 4 is about the actual size, and these are used to support the rod which is shown in Fig. 1. This rod I bought at a veneer shop in Birmingham, and these also are of American origin. I think the wood is birch, and the rods are about three feet long, and are turned in several sizes. You require one of half inch diameter, as its use is to hold the clip, which, when you buy it, is like Fig. 6. Simply bore the ends of the rod sufficiently to take the nose of the brackets, as in Fig. 9; then, having firmly fixed one of the brackets, and also the other, with the exception of the outer screw marked with the cross, spring into place and screw up. These brackets, of course, are affixed on the *front edge* of the board. Next, get your clothes-peg, as in Fig. 6, and file up so that it will grip the rod, as in Fig. 7. Then, with a tenon saw, cut a clean kerf, as in Fig. 8. This kerf comprises the whole tool, as two or three strings may be held by it, while the clip runs on the rod with friction; hence any position or angle may be retained. The diagram, Fig. 13, shows the relative positions of base, board proper, rod, clip, bridge, and strings being held.

Having used this handy little contrivance for many months, during which I worked some of the most complex designs, I can recommend it as of as much use as a third hand. Those who have wrestled with macramè on the flat can have no idea of the comfort with which one can work when the board is tilted to an angle of 45°, and although the entire board as here given requires space when not in use, its great solidity and practical value cannot fail to be appreciated by all who try it. Of course, the board might be made to fold up flat with its base, or the latter be dispensed with, but as this would be at the expense of stability, a prime consideration in this work, I for one shall stick to the fixture.

I may add that at first I made a pair of rollers for each end; one on the top, and the other under. These were fixed with similar brackets, but those having an *eye* instead of a *slot*. My idea was to work, say, 4 ft., and then to roll that under and work the remainder. In theory, this was fine, but practically it did not "gee." There was the difficulty about getting the foundations tight, and I discovered that it was as easy to take the work off the board, take a good grip through the pattern, near the foundations, with drugget pins, and "belay" afresh. For such, however, as may wish to try this dodge, I may say that about an inch must be cut out of each end of the board, leaving projecting lugs on which to screw the brackets, and that the latter are affixed on the face and under-side of the board, and not on the edges. With these rollers pegs are inadmissible, but bridges may still be used. A useful tip for macramè workers is: Don't bother to count the stitches; use callipers instead. With care, these will always measure to a half stitch, provided the work is evenly done.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

101.—TOLHURST'S HEAT-RESISTING MASTIC PAINTS.

THESE paints, which are highly spoken of and warmly recommended by those who have used them, are made, as their distinctive name implies, from prepared mastic, known as "Patent Mastic," and have the merit of being entirely free from white and red lead or any other poisonous ingredients. They are ground as fine as enamel, and are therefore as suitable for all kinds of decorative work within doors as they are for outside work. Further, they are specially suited for hot climates, as they will resist all action of the weather, from the intense heat of tropical climates to the vigour of the depth of winter in the Arctic and Antarctic regions. In addition to these good qualities, it is claimed for them: (1) that they are comparatively inexpensive; (2) that they possess covering and penetrating qualities to a greater extent than any lead or oxide paints; (3) that they are extremely durable, and remain, when applied to any surface, in a sound and perfect condition for many years; and (4) that, owing to their heat- and cold-resisting properties, they will not crack or blister under any circumstances. For these valuable qualities they cannot fail to commend themselves to engineers, tool-makers, boiler-makers, contractors, railway and steamship companies, ship-builders, gas and water companies, etc., for whose use, indeed, they are specially prepared. They have an especial affinity for iron, and penetrate with ease the smallest pores, thus affording complete protection against the deteriorating and oxidising influences and action of the weather. Sample tins of 1, 2, 4, 7, or 14 lbs. may be had and prices may be ascertained by application to the manufacturers, Messrs. Tolhurst & Son, whose offices are in London, and whose precise address may be obtained by reference to Kelly's London Directory. I have frequently been asked during the last ten years what paint or enamel would be most suitable for model engines in virtue of its durability and heat-resisting properties, and I have not been able to name any paint in ordinary use which would fairly answer the purpose, and present a hard and permanent surface when dry. It seems to me, however, that the difficulty may be met by the use of these paints, of the existence of which I was unaware until a short time ago, and which I am now inclined to recommend for the purpose mentioned. This firm also manufactures and supplies an equally good steam joint mastic; excellent non-poisonous mastic enamels; gasholder paints, especially prepared for submerged surfaces, and drying quickly with a fine gloss; flat paints, which also dry quickly with a perfectly dead surface, and quick drying funnel paints. Of these the non-poisonous mastic enamels must be applied with a soft, clean brush, until they have ceased to flow, and if found to be too thick for any kind of work they may be thinned with enamel thinnings. They dry quickly—so quickly, indeed, that two successive coats may be given in one and the same day—and present, when dry, a firm, hard, glazed surface, resembling the glaze on porcelain or earthenware, thus obviating any necessity for varnishing. With regard to the steam joint mastic it is pointed out that 1 cwt. of it is equal in bulk to $1\frac{3}{4}$ cwt. of red or white lead. The directions for its use are as follows:—"Roll in the hand a piece the size required, and with the aid of a portion of hemp or twine (if considered necessary) proceed in the same manner as in making a lead joint; if possible, it should be made while hot—that is, unmade and made while working, and the pipes almost too hot to handle and wiped perfectly dry. After the joint is made put pressure on gradually." These paints and other kindred substances, into whose preparation the "Patent Mastic" enters, although they may be well known in the trades in which they are used, are not known so widely as they should be by amateurs. For example, I must confess that they were not known to me until my attention was called to them by a friend of the proprietor and patentee. But to me their value is now fully apparent, and I do not hesitate to recommend them for the purposes indicated above. A card of the various colours in which the paints are made will be supplied to applicants with price list upon enquiry of the manufacturers, whose name is given above.

THE EDITOR.

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SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

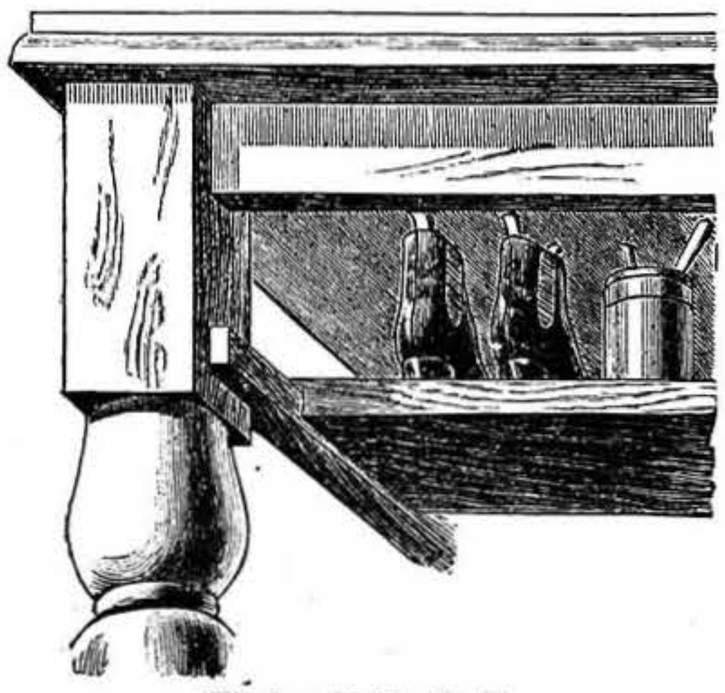
*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Testing Accuracy of Framework.—J. C. K. (*London, W.*) writes, in sequence to J. S. and G. P. (see pp. 507 and 523):—"As we differ on a very clear matter of fact, and every process of a reliable mode of testing accuracy of square or right angles of framing, and as it is one of the simplest operations in mechanics, I am content to leave it to the judgment of those workers who have to test for squareness of their work. It is needless to repeat the same arguments; I will simply add that, if the square frame is winding, the diagonals being alike for length would prove the frame was not square at two angles. I have had to point this out to learners under me, and in surveying on uncertain levels, it would be misleading if ever attempted, and be no proof. Why Euclid is referred to I do not know. The laws of Euclid would prove my contention that same length diagonals may indicate a trapezoid. If the opposite sides of a picture-frame are equal, and the angles square, no other test is wanted for accuracy."

Kitchen Table Shelf.—A. B. (*Salford*) writes:—"The annexed sketch represents a shelf fixed between the legs of an ordinary kitchen table, where it will be found useful for the disposal of boots, blacking-brushes, and other articles. The bearers are notched and screwed to the table legs;



Kitchen Table Shelf.

the shelf is rebated at the ends, and rests loosely on the bearers."—[Thanks for the suggestion, which will no doubt be serviceable in its idea. Boots and blacking-brushes, however, would be replaced by some more wholesome articles in my household. —ED.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

WORK Exhibition.—A. M. L. (*Bedworth*).—There will be no Exhibition again for the present; but if you have any novelties, let us see them on approval for WORK.

Photography.—G. C. (*St. Blazey*).—Always consult the indexes of WORK, Vols. I. and II., when you wish to learn as to the past contents of the publication.

Chemistry.—H. B. H. (*Leicester*).—The best book for qualitative analysis is Clowes' "Practical Chemistry," published by J. and A. Churchill at 7s. 6d.; and for quantitative analysis, Thorpe's "Quantitative Chemical Analysis," published by Longmans, Green & Co., at 4s. 6d. The best plan is to thoroughly master qualitative analysis before starting the quantitative. If Clowes' is too expensive for you, Thorpe and Muir's "Qualitative Chemical Analysis," published by Longmans at 3s. 6d., is a good book, although I prefer Clowes'.—F. B. C.

Brass Moulders.—J. B. (*No Address*).—The only flux we ever use is a piece of yellow soap, say, as large as a five-shilling piece, put into an average-sized crucible, and stirred well into the metal, just before pouring into the mould.—J.

Electric Night-Light.—FRISKY.—Lamps of 5-candle power may be had from vendors of electrical materials. In your town they may be obtained of Messrs. King, Mendham & Co., Narrow Wine Street and Fairfax Street. These lamps are made to work with current from batteries of various sizes and types, and are numbered to indicate the voltage of the current required to light them. By this system we are able to choose a lamp to suit a selected battery, or a battery to suit a selected lamp; lamps of 5-c.p. range in voltage from 5 volts to 65 volts—that is to say, their filaments offer a varying resistance, requiring these variations in the voltage of the current to light them. To light a 5-c.p. lamp we must first know the voltage required to light it, and then choose a battery giving the required voltage. Suppose we have an 8-volt 5-c.p. lamp to light with current from a battery: the battery must give a current having an E.M.F. (electro-motive force) of 8 volts. The highest E.M.F. obtainable from one cell of the bichromate or chromic acid type is 2 volts, so we shall need four such cells connected in series to form the battery of this type for our lamp. The E.M.F. of a Leclanchè cell is 1·60 volts, and that of a dry cell from 1·50 to 1·55 volts. We shall therefore require six cells of either of these types to light the lamp. You will therefore see how wide your question is respecting the number of cells it would take to light a 5-c.p. lamp. Now as to the best battery for the purpose. A few months since I should have said there is only one battery suitable, and that is the chromic acid battery. I find now that there are several batteries more suitable for night-lights in the bedroom than the messy chromic acid or bichromate of potash batteries. The large size six-block agglomerate Leclanchè cells are preferable, because there is no offensive odour from them, but they cost from 9s. to 10s. 6d. each cell. The ordinary Leclanchè of large cells, costing 4s. 6d. per cell, has been used, and I have a correspondent who used such a battery. On the 27th of October, 1890, he discarded the Leclanchè, at my suggestion, for a battery of Gassner dry cells, and he writes: "I have had no further trouble. They have not been touched since, and apparently are now as good as the day I started them. One night I left the light on by mistake. By morning the battery had run down. In twelve hours it was usable again, and in forty-eight as good as ever." The Gassner is retailed at 4s. 6d. per cell, but there are other dry cells besides this one. I have now an electric lighting night-light set, sent on approval for trial by the Electric Stores Company. This set is furnished with four E.S. dry cells and a 4-volt lamp, watch-stand, etc. The lamp will light up the face of watch and show the time on pressing an ordinary push-button. The lamps cost about 5s. each. The current can be switched on and off by an ordinary switch.—G. E. B.

Fire-Boxes.—J. H. (*Hunslet*).—We are gratified at the appreciation of our labours expressed in the communication of our correspondent, and have given his suggestion our careful attention and consideration. As it is our wish and endeavour to place before our readers and subscribers such information and instructions as will enable them to carry out such matters with the *ordinary* means at their disposal, we are satisfied that any instructions or information we might give on the subject referred to would be of no practical use, inasmuch as to perform work of the kind is out of the power of the general run of our readers. For instance, the following plant and tools are needed for the work: Rolls to take the buckles out of the plates; a slab on which they are trued; drills and cutters for making the holes for the rivets, stays, and tubes; screwing machine for threading the stays between the inner and outer boxes; taps for threading the holes in the plates; reamers for truing the holes for the rivets; a tube expander for tightening and fixing the tubes in the plates; a set of caulking tools for the joints; flogging and hand hammers for caulking and riveting; holding-up hammers and a "dolly" for the riveters; a rivet forge for heating the rivets; a smith's forge; a die, snap, or cup for forming the ends of the rivets, and if they are "countersunk" then there will have to be a countersink for so forming the holes; also chisels for cutting off the ends of the rivets in the old boxes, and punches or drifts for driving out the old rivets; besides many other small appliances and conveniences usually found in well-appointed boiler shops. Added to these are required the services of *skilled* workmen to set out the plates and do the work in the proper way; it would have to be done to make it a sound and *safe* job. We think from this our correspondent will be able to judge how far any instructions and information we might give would be of *utility* to our readers. That they would be *interesting* we do not doubt. We should not advise any of our readers who have not been *practically* trained in such matters to attempt to meddle in them. New fire-boxes are put in by the makers of such engines at such a reasonable price, that it would be the height of folly for anyone not qualified to attempt it, and the owner of such an engine requiring such repair should at once send it to the maker whose name and number appear on the plate attached to it. It is not our desire to lead any of our readers into trouble, or afford them facilities for getting into it.—C. E.

Patent.—J. B. T. (*Manchester*).—You cannot patent an *idea*. On application to the Patent Office, Chancery Lane, London, E.C., you can be supplied with printed forms.

Clarionet Reeds.—F. J. O'C. (*Dublin*).—You cannot do better than apply to Besson & Co., Euston Road, London.

Prizes for Competition in WORK.—J. L. (*Bradford*).—We have already given prizes to readers of WORK for bookcases, and doubtless there will be further competitions on a more extended scale.—ED.

Colouring Brass Work.—J. P. (*Birmingham*), referring to a receipt given at p. 779, Vol. I., asks how I make my chloride of antimony liquor. As a matter of fact, I do not make it at all, but get it at a chemist's; but chloride, or butter, of antimony, is obtained by dissolving crude or roasted black antimony in hydrochloric acid, adding a small quantity of nitric acid. You are right in supposing that articles may be bronzed by dipping in the ordinary way. My remarks, as quoted by you, were, if I remember aright, made in reply to a query, asking how to colour the brass ferrules, etc., of fishing-rods; and I, therefore, recommended what I think the most satisfactory method.—OPIFEX.

Polishing Marble.—J. M. (*Paddington*).—The usual plan is to lay the slab flat, and first rub it down, if necessary, with a coarse grit. The rubbing is done with a flat stone and water; pounded Yorkshire paving-stone makes good grit. It is then rubbed smooth with wet sand in a similar manner. Lastly, the actual polishing is done with putty-powder, which is applied on thick felt stretched on a block of wood, and, of course, wetted. All the materials are sold by marble merchants. A little salt of sorrel used with the putty-powder brings the polish more quickly; but if the marble is black or coloured, this must be used with caution,—M. M.

Writing-Desk.—CAB.—Taking it for granted that the desk you require is of the form shown in Fig. 1, I will describe it. Your suggested sizes, 15 in. by 10 in. by 6 in., would answer, making the front, say, 5 in. deep; four ½ in. boards for the sides, one ¾ in. for flap, and one for top back piece; a 1 in. bottom board, and three pieces for top gallery, besides two hardwood rails—this is the amount of wood required. Dovetail the sides together (as per instructions in back numbers), having previously shaped two or three tenons on their bottom edges; and to their tops, at the back, dowel the narrow top board, which is supposed to have been hollowed out for the reception of two ink-pots and pens. All tenons should be ½ in. deep, those at the sides fitting into ½ in. deep mortises in the bottom board, and those on the front and back lodging in clear mortises. Shape the under-side of the bottom board, at back and front, as in Fig. 2,

Fig. 2

Fig.

Fig. 3.

Writing-Desk. Fig. 1.—Desk. Fig. 2.—Under side of Bottom Board (one corner). Fig. 3.—Elevation, showing Front Board tenoned to Bottom Board and secured by means of Rail.

for ½ in. deep, in a line with the clear mortises, and insert a ½ in. hardwood rail. Thus, when the back and front sides are joined to the bottom board, their tenons will contact with the ½ in. rail, and by screwing the latter from underneath, and the bottom board to the upper boards, as shown in Fig. 3, a strong job may be made. You will see that by this arrangement a half-inch firmer hold is obtained by the screws used in connection with the bottom and upper boards than would otherwise be the case. You can dispense with these rails if you wish, merely screwing the bottom board to adjacent parts without their intervention. Stringing is done by the strings being glued into straight or curved grooves cut for the purpose in the solid wood, being pressed by the tool handle meanwhile. For the moment, I cannot say where you may obtain a catalogue containing prices of stringing; but should I eventually hear I will let you know.—J. S.

Stove Trivets, etc.—J. W. (*Swindon*).—To comply with your request for illustrations and designs for meat cranes, stove trivets, and flat-iron stands, I should require (to give anything of an assortment) about two pages of "Shop," which I am quite certain I should not get. Why not go to the nearest ironmonger, and ask him to show you the pattern books of the Carron Co., Stevens, McDowell and Co., and the General Ironfoundry Co.? and in them you would find a good assortment to select your patterns from. When will correspondents learn that it is impossible to give replies in "next issue?"—R. A.

Violin—Lantern.—H. McM. (*Bootle*).—You will find articles on the Triunial Optical Lantern in Nos. 83, 87, 91, 96, and 100 of WORK; and papers on Violin Making in Nos. 105, 110, 114, and 118.

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An Invalid's Folding Adjustable Reading Stand.—INVALID.—It is a curious fact that, upon receipt of your query for an invalid's reading stand, I was being compelled to indulge in the indolence of lying a-bed, where I had been shifting uneasily for several days, as the consequence of a slight accident I had met with. Strangely enough, I had been trying to discover how I could accelerate my professional labours by the aid of a piece of furniture; for the accident did not debar me from using my hands and arms. I had not quite designed one satisfactorily to myself when your letter was handed to me. Being in a position to sympathise with other invalids, I could the better comprehend their requirements; and I hope that the present result of my scheming will be of assistance to you. It is of very little use for me to give sizes, as in this case, more so than in many others, they are a matter of individual necessity. This article is intended to stand upon the bed, a foot being on each side of the invalid. Commence the construction by having a stout rail, the length of which will cover the distance across the invalid's body (bed-clothes included), and also allow a few inches extra at each

Fig. 1.

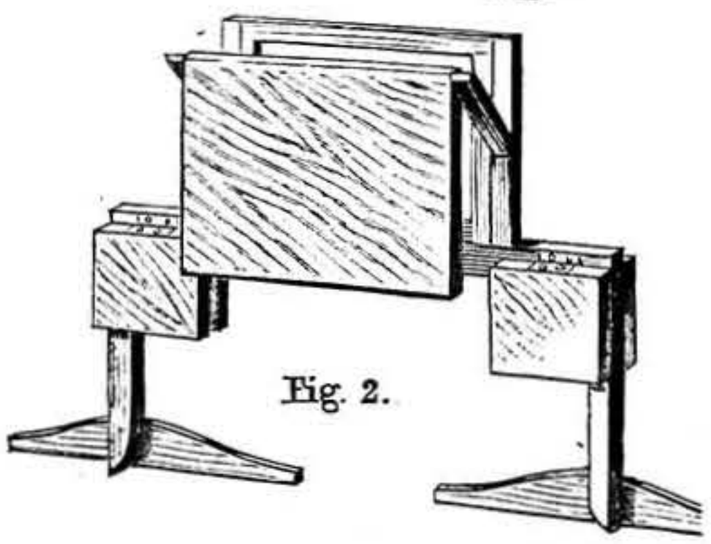

Fig. 2.

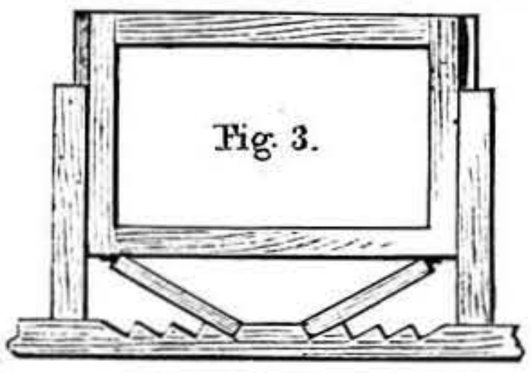

Fig. 3.

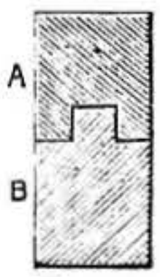

Fig. 4.

An Invalid's Folding Adjustable Reading Stand. Fig. 1.—Stand unfolded. Fig. 2.—Stand folded. Fig. 3.—Adjustable Frame for Stand. Fig. 4.—Section—A, Uprights; B, Adjustable Frame.

side. To the top of this rail should be joined two others, the distance between them being the same as the length of the desk-board. At each end of the long rail, underneath, will be joined an upright, to the bottom end of which will be hinged a long foot in such a manner that it can be adjusted as in Fig. 1, or folded, as in Fig. 2. To the top uprights should be joined, diagonally, two supports, between which the desk-board will be pivoted. Between the uprights should run a frame, as in Fig. 3, to the bottom edge of which may be hinged a pair of short rails to fit into notches on the long rail. The outside end edges of this frame should be tongued, and the inner edges of the fixed uprights grooved (of course, previous to joining together). The frame can then be easily raised, and the desk-board kept at any required slope, by permitting the short rails to fall into the notches. Fig. 4 shows section of frame and uprights. Now, I have added something which you did not ask for, but which I consider, from my own bed experience, will be useful to you—viz., the shelves. A pair of small boards should be hinged to each end of the long rail. To save a lot of labour in placing supports for these, I should simply advise the use of a string loop, each end of the latter being fastened to one of the shelves. If a nail or stout pin is driven into the thickness of each top upright, the string can fit over it, and thus support the shelves. It should not have a very large head; otherwise, when the loop is slipped over it, the shelves will be on the slant, instead of horizontal. Thickness for wood, you must decide. For strength, here and there fix a little bracket. You will require a narrow strip of wood to support the book, and also hooks to keep the leaves down. These hooks can be fixed on top, at the side, or at the bottom (for making, see p. 553, No. 35). You did not ask for a folding article, but I have designed it as such, for occasional convenience when not required. If, however, you would prefer it solid, you will have no difficulty in making it so. I think this article is to be preferred to one to stand by the bedside, for, by my late bed experience, I find that in bending in the bed it makes one's back and shoulders ache. I sincerely trust that but few of my readers will find it necessary to avail themselves of these suggestions.—J. S.

Hydrogen Furnace.—T. M. (*Liverpool*).—You could not make one of these so cheap or so satisfactorily as you could purchase one. Some very excellent furnaces are made by Thos. Fletcher & Co., Warrington. They will melt brass, copper, cast iron, and nickel, in quantities from 6 oz. to 28 lbs. The size of gas-pipes for the smallest quantity is ⅜ in., and range from that to 1½ in. With a chimney with a fairly good draught, they will melt copper; but for cast iron or nickel a blower is required. With a blower, they are calculated to melt a crucible of cast iron in seven minutes, steel in twelve minutes, and nickel in twenty-two minutes. If you send four stamps to the firm, they will send you their illustrated catalogue of melting furnaces, when you will see the various kinds they make. I should imagine it is one of these that is referred to in the article you name, but I have not seen it. If, after gettingthe catalogue, it is not what is referred to, if you send me the paper, I will try to give you some information respecting it. You will find drawings of the various kinds of furnaces in the catalogue, with prices and full particulars.—M.

Electric Motors.—H. C. (*Birmingham*).—Information respecting the Gassner dry battery was given in No. 83, p. 497, Vol. II.; and instructions on making and working accumulators were given in No. 101, p. 790, Vol. II.; and illustrated instructions on how to make a model electro-motor were given in No. 109, p. 71, Vol. III. of WORK. These three numbers can be forwarded to you by the publishers on receipt of 4½d. in stamps. For further information, consult back numbers.—G. E. B.

Battery for Electric Light.—W. B. (*Lewisham*).—The electric light battery described in "Shop," No. 131, p. 428, Vol. III. of WORK, in reply to F. G. (*Paddington*), cannot be re-charged with current from a dynamo. It must be re-charged by pouring away all the old spent solution, cleaning the plates and cells in water, and re-charging the cells with a fresh solution, made as directed in that reply. Such single-fluid batteries will maintain an electric light for about three hours; after which time the solution becomes spent or exhausted, and must be renewed.—G. E. B.

Small Dynamo.—LABOUR.—I cannot advise you to attempt making the Brush dynamo. You will find those described in Nos. 92, 97, and 99, on pp. 676, 724, and 756, Vol. II. of WORK, much more simple in design, easier to construct, and quite as efficient for your purpose as a model Brush. Full illustrated instructions for making the Siemens, Gramme, Manchester, and Simplex dynamos are given in these numbers. No. 14 gauge copper wire is much too large for winding a model dynamo, and 65-volt 16-c.p. lamps unsuitable for such a small affair as yours. You will find full information in the articles on Model Electric Lights in WORK, Vol. II.—G. E. B.

Universal Lathe.—Mr. R. Price's present address is Stratford Road, Plaistow. It is on the Tilbury Line from Fenchurch Street Station. He is now working in his own little shop, and no longer in connection with Watt, Winnell & Co.—F. A. M.

Horse Power to drive Dynamo.—J. R. (*New Brompton*).—The following table will help you in determining the horse power needed to drive the Gramme dynamos:—

Nos.	*Watts of Current.*	*C.P.*	*H.P. Required.*
1	125	30	¼ to ½
2	250	80	½ to ¾
3	550	180	¾ to 1
4	1,650	475	2

Dynamos always run best when the horse power of the engine is in excess of the maximum power required to drive the machines.—G. E. B.

Boiler Pump.—PUMP.—I assume that the force pump is required to work in conjunction with a model engine, from the size of boiler given. You do not give the evaporation of water or other particulars from which to determine the capacity required in pump; but I think that illustrated below is about the size suitable. The figures are full size for a pump with a ¼ in. diameter plunger, having 1 in. stroke. Fig. 1 is a plan of the top of pump and valve-box; Fig. 2, a vertical section of the same; and Fig. 3, a horizontal section taken on line (1—2). The cylindrical part of the plunger, A, is ¼ in. diameter by 2 in. long, turned throughout; and it terminates at the top in a flat extension, having a hole-pin to receive a pin, by which the plunger is connected with a hand lever, or with a connecting-rod from a crank or eccentric on an engine-shaft. The plunger should be made of iron or steel. The plunger is worked up and down, in a chamber about ⅜ in. diameter, in a brass casting, B C, this chamber being on the side, B. The valve-box is formed on the side, C. It is not absolutely necessary to make the casting of brass, but for small work like this it is preferable. The general thickness of metal is ⅛ in., but where the pump-barrel and valve-box join, it is $\frac{5}{16}$ in. The top of the pump-barrel is bored out to fit the plunger, around which also fits a screw-gland, D, which screws down into a stuffing-box, O, filled with greased hemp packing, or packing of some other kind, to keep the plunger water-tight. The valve-box, C, communicates with the pump-barrel by a passage, L. The valve-box must be bored out to receive the seats of the inlet and outlet valves, K and J, which are shown as ball-valves, but may be of other form if desired. For special information on the subject of pump-valves, see WORK, Vol. I., p. 513 ("Pump Valves"). The balls sold for bicycle bearings may serve this purpose. The seats of the valves are turned so as to be a light driving fit to the valve-box. This will make them water-tight in the casing if the workmanship is good. The upper seat forms a stop for the inlet or suction valve, K, and a screw-plug, E, which closes the valve-box,

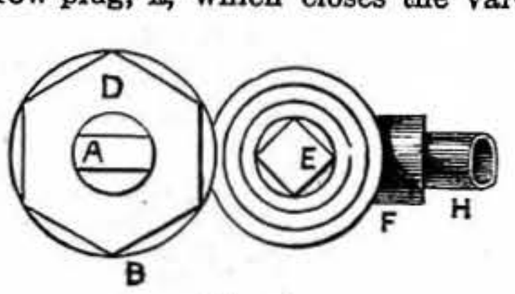

Fig. 1.

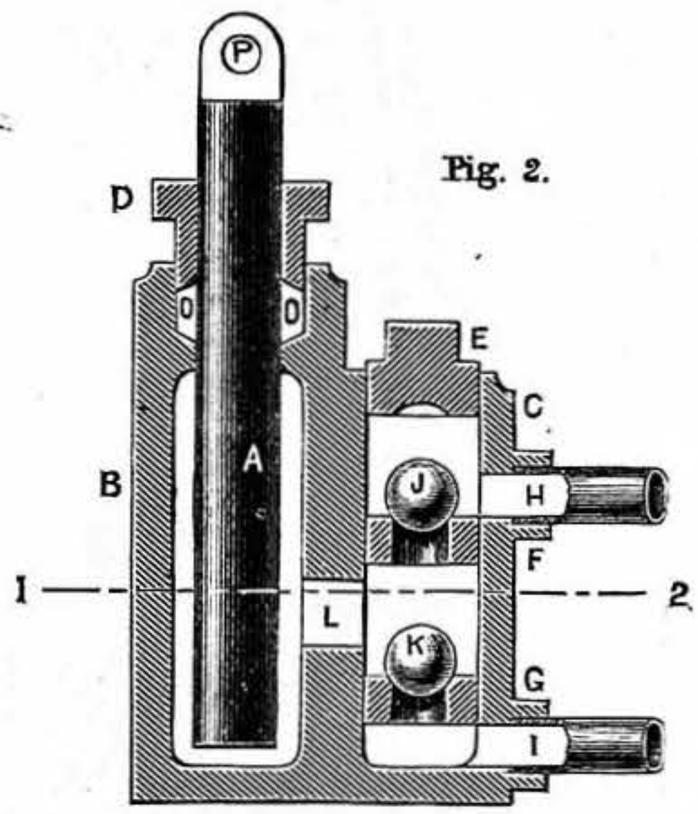

Fig. 2.

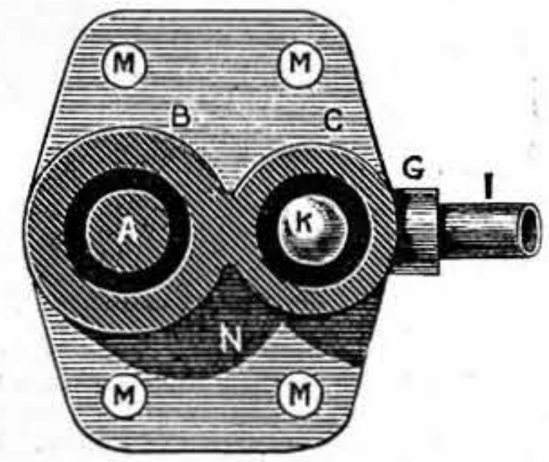

Fig. 3.

Boiler Pump and Parts.

forms also a stop to outlet valve, J. If there is any trouble to be anticipated about boring out the valve-box, it can be cast open at the bottom, and closed there by a screw-plug. The bottom seat may then be forced in from the bottom end, and the top seat from the top end of the valve-box, and a collar can be left between to secure their correct positions. I is a suction pipe and H an outlet pipe to the boiler. These pipes, about ¼ in. diameter, are screwed into sockets, G and C, in the positions shown. The bottom of the casting is extended on each side, as shown at N, to form a base-plate, with holes, M, for bolting or screwing it down to a frame. Instead of leaving a base-plate, side brackets may be cast on barrel, B, but this will depend upon the frame to which it is intended to fix the pump. At each up-stroke of the plunger a quantity of water is drawn through valve, K, and at each down-stroke a like quantity is forced through valve, J, and pipe, H, to the boiler. It will take about 700 strokes of this pump to deliver a pint of water into the boiler; so, from this *datum*, if you find the evaporation of boiler for a given speed of engine, you can calculate if the pump is sufficiently large for your boiler.—F. C.

Jules Verne's Electric Light.—F. M. (*Liverpool*).—Jules Verne's imagination has created a future for the electric light which seems unattainable,

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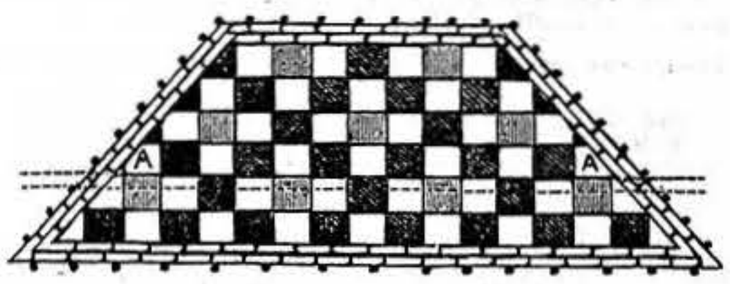
and must, therefore, be regarded as pure fiction. No such lamp as that mentioned in his story, "A Journey into the Interior of the Earth," has yet been invented. It is true that luminous effects can be obtained from Geissler vacuum tubes when the secondary current from a Rhumkorff induction coil is sent through them; but these effects cannot be said to equal an electric light from incandescent lamps; nor would the light from a Geissler tube lamp be sufficient to guide an explorer's footsteps along subterraneous passages. I am not aware that such a lamp has been used for a photographer's dark room. An apparatus suitable to this purpose was described and illustrated in No. 89, p. 592, Vol. II. of WORK.—G. E. B.

Lead Glass Work.—S. I. W. (*Paddington*).—Below, you will find a sketch, showing about the shape, I presume, you would want one side of the top of your fern-case to be. You will find that, by the time you have bought the materials, etc., necessary to do a job of this kind, it will be a very expensive fern-case; but if expense is not so much an object as the pleasure of doing the whole thing yourself, you will accomplish what you wish with care and a little patience. I will now try to explain, by as simple a way as possible, how you can do it. First, set out on a piece of paper the exact size and shape you want; then decide and mark out the design and colours you would like. In buying your glass and leads, I should advise you to allow somewhat lavishly for waste, breakages, etc. Next, stretch your design (which, we will presume, is as the sketch below) flat on a board or bench; and, under the row of glass marked A A, lay a length of lead, opening out the grooves with a piece of hard wood, shaped to the form that suggests itself to you as being most suitable, to allow the glass to be inserted without any trouble. See that this lead is perfectly straight, and keep it in its place by a straight-edge lightly fastened below, as shown by dotted line, and some 1½ in. panel pins, driven lightly into the board or bench above, so as to keep the length of lead firmly in its position, shown by the drawing, under it. Now cut your first square of glass above this, beginning from the left-hand end, and fix it with pins driven lightly in above and on the left-hand side; next cut off a short length of



Lead Glass Work Pattern.

lead, and fit it up to the right-hand side of glass, making it sufficiently short to allow of the piece of lead coming on the top of this row to clip the glass; then follow with another piece of glass and lead, and so on to the end, drawing out very carefully any pins that may be in the way, and that were used to keep the first piece of lead in its place. Keep this row in its place by pins driven lightly on the right-hand side of last square; but draw out any that you may have put on the top of this row, and lay the next length of lead along and proceed in the same manner until the top half of the centre is complete. If you now carefully take up the straight-edge from under row A A, you can work downwards, and finish the bottom half, securing the whole with pins, as described. Next cut and fit in the corner pieces up the sides, and cut the long pieces of lead to their right length (which, by the way, should have been cut as you went along). You can now proceed with the border in the same manner, taking one side at the time; and when it is ready for soldering, it will be held together by pins all round it, as shown in sketch. Do not be afraid of putting in sufficient pins. If you now put a dot of solder over each joint, taking care that the heat of your iron does not crack the glass, you can then draw out the pins, and turn it over very carefully and solder the other side. The best iron, etc., for this I have already explained on p. 92, Vol. II.—E. D.

Cutting Cone Patterns.—TINNY.—My next article will deal with this subject. It is too long to properly explain in the limited space of "Shop."—R. A.

Lantern Carrier.—F. R. (*Gosport*) asks which is the best lantern carrier, and wants a dissolving effect with a single lantern. It is impossible to get the same effects with one lantern that can be got with two or more. By the carrier of which I give a description an instantaneous change of slides can be procured. Fig. 2 gives the carrier frame, A, in perspective, and B perpendicular section. At the lower part a piece is taken out as at *a a*—the width of the front—and sets as a saddle; the spring front pressing against it will keep it perfectly firm. Fig. 1 is the carrier proper; A gives it in perspective and B in plan. None of the Figs. are drawn to scale, and are purposely exaggerated in some points for the sake of greater clearness; but as dimensions are given, no error can be made. It will be easily understood that Fig. 1 slides in Fig. 2. At *a a* in Fig. 1 are screws which are used for the purpose of correct registration or bringing the picture in the centre. The slide is dropped in the groove from the top, when the carrier is flashed across and the slide last exhibited is removed, and a new one substituted. The carrier is now driven in the opposite direction. The one from which I have taken the copy is a home-made one; it is easily constructed, and quite as efficient as an expensive one from a dealer. I think the drawings are so plain that no further description is needed—except to say that

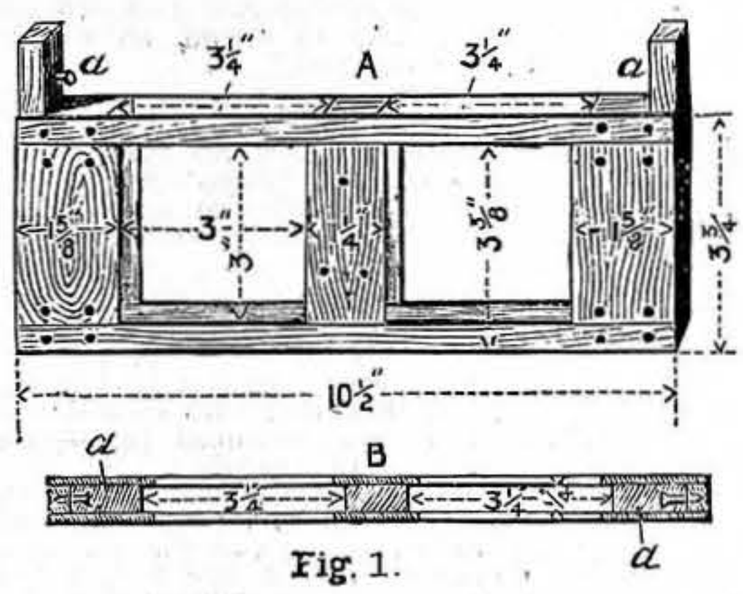


Fig. 1.

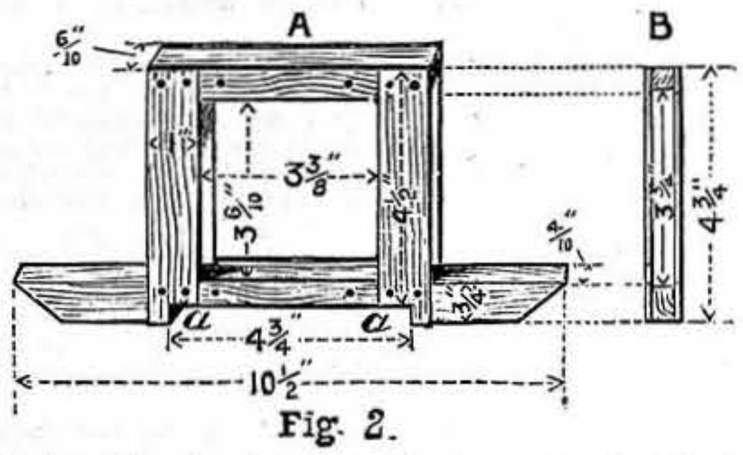


Fig. 2.

Lantern Carrier. Fig. 1.—Flash Carrier for Single Lantern. Fig. 2.—Guide Frame for Carrier: A and B, Plan and Section.

the proper width of the saddle-piece marked *a a*, in Fig. 2, must be determined by the width of the stage of the lantern; the one before me is 4¾ in.—O. B.

Bookshelves.—QUARTO.—Your desire to fill a recess with bookshelves, enclosed by glass doors at the lower portion, without undertaking the labour of making a complete bookcase, is one the answer to which should commend itself to many other readers. So far as individual shelves are concerned, each might loosely lodge upon supports (A, Fig. 1), the latter being screwed to the wall as shown. If the wall is of such a nature that screws directly contacting with it are of little use, drive stout dowels, an inch or so long, into it under the end of each shelf; the object of the dowels being to accommodate the screws, thus permitting due tenacity. It is in no way compulsory to have either side or back board to the enclosed portion, as the doors can be hinged to narrow boards, which are

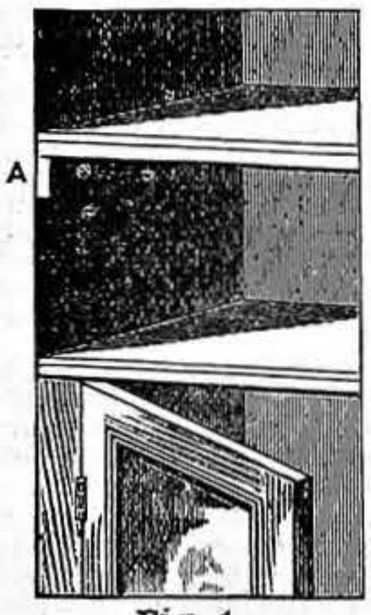


Fig. 1

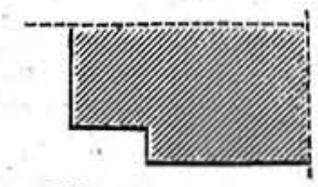


Fig. 2.

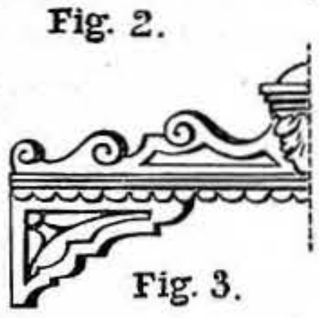


Fig. 3.

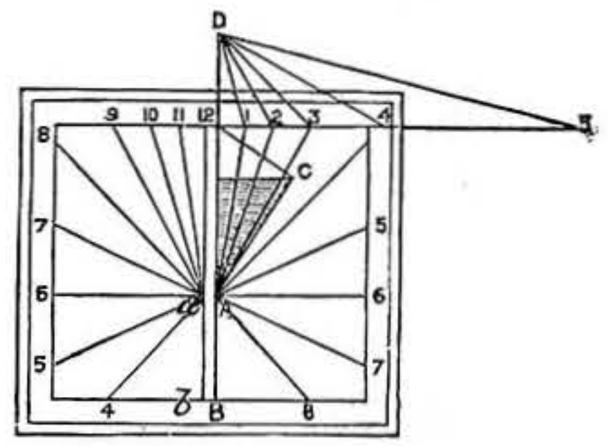
Bookshelves. Fig. 1.—End of Shelves and Top of Door. Fig. 2.—Corner of Enclosed Shelves. Fig. 3.—Pediment and Bracket for Shelves.

screwed or joined vertically between the board immediately above them, and one screwed to or near the floor. These uprights should also be screwed to any intervening shelves, the latter having their adjacent corners shaped as in Fig. 2, in order to permit this to be done. The back numbers of WORK will give you many designs of pediments and brackets suitable for adoption above and below your shelves; but perhaps those shown in Fig. 3 will assist you. The nature of the wood most suitable for you to use depends upon the appearance of your surrounding furniture, your taste, skill, and banking account. Either oak, walnut, or mahogany, pitch pine, deal, or, in fact, any wood, will equally suffice.—J. S.

Materials for Coils.—COMMUTATOR.—It must have been several years since you experienced such indifferent treatment at the hands of the dealer in odds and ends, as the paper you mention has ceased to exist as a separate publication. I have no cause of complaint against the person mentioned by you. The building is crammed from floor to roof with a large assortment of useful oddments, which should be seen and valued before purchase.—G. E. B.

Accumulators.—H. M. (*Keighley*).—Accumulators have been mentioned in "Shop" on pp. 477, 541, 749, 829, Vol. I.; on pp. 44, 226, 245, 266, 307, 632, Vol. II.; and on pp. 126, 172, 204, 285, 443, 475, Vol. III. of WORK. An illustrated article, showing how accumulators are made, appeared on p. 790, Vol. II. of WORK. The articles on Model Electric Lights were published in Nos. 76, 82, 89, 92, 94, 97, 99, 101, and 104, all in Vol. II. All back numbers and indexes are in print.—G. E. B.

The Horizontal Dial.—J. M. (*Aberdeen*) finds a difficulty in setting out a dial satisfactorily by the method given in WORK. It is possible that he may not have worked out the rule correctly, or fixed his dial with sufficient care. Another and perhaps simpler (though less compact) method for finding the hour-lines is, however, given below, with which, it is hoped, he may have better success. His opinion that the same hour-lines ought to serve for any place, irrespective of latitude, is not tenable; why it is not, he will see if he consults any work in which the principles of dialling are explained, as they are in most encyclopædias. *For setting out an horizontal dial for any proposed latitude*, draw the line 12 A B as the meridian or 12 o'clock line; parallel to which draw a second line (12 *a b*), at such a distance as will give a proper thickness for the gnomon. At right angles to these draw 6 *a*, A 6, for the 6 o'clock line; make the angle 12 A C equal to the latitude of the place, and from 12 let fall the perpendicular, 12 C, upon A C. Make 12 D upon A 12 prolonged, equal to 12 C. From D draw lines, D 1, D 2, D 3, etc. (to terminate in the line 12—5, perpendicular to 12 A), and to make angles, 12 D 1,



Horizontal Dial.

12 D 2, 12 D 3, etc., equal to 15°, 30°, 45°, etc. Then from the centre, A, draw A 1, A 2, A 3, A 4, and A 5 for the hour-lines of 1, 2, 3, 4, and 5 in the afternoon. Take on the other side of the meridian or substylar line, 12—11, 12—10, 12—9, etc., respectively equal to 12—1, 12—2, 12—3, etc., and from *a* draw the lines *a* 7, *a* 8, *a* 9, etc. All the hour-lines from 6 in the morning to 6 in the evening are now drawn, and it only remains to produce the afternoon lines, 4 A and 5 A, to give the morning lines, *a* 4 and *a* 5, and the morning lines, 7 *a* and 8 *a*, to give the evening lines, A 7 and A 8. The thickness of the gnomon has already been determined; the elevation of its style will be that of the angle 12 A C (equal to the angle of the latitude). It will be placed perpendicularly to the plane, on the space left for it with its angle, A, at *a* A, and its substyle extending towards 12.—A. Y.

Intensity Coils.—A. J. L. (*Gloucester*).—All instruments in which there are two coils of wire—a primary coil through which the exciting current passes, over-wound with another coil of wire in which an induced current of electricity is formed—are "induction coils." The name "intensity coils" is given to those which develop a high tension current in the secondary wire. "Medical coils" are induction coils constructed specially for medical and surgical purposes in the relief and cure of disease. The tension of the current from these is not so high as that from an intensity coil. By "ordinary coils" is meant the instruments made for and sold by opticians and dealers in electrical sundries, and advertised in the papers at low prices. These are nearly all imported from France. The ordinary coils mentioned by Dyer are the ordinary shocking coils furnished with a regulating core or a sheath to the core, to lessen or increase the inductive effects of the current. The various kinds of coils met with are all described in "Induction Coils," published by Messrs. Whittaker & Co. The principles of coil construction are given in a series of articles now in the Editor's hands, and I shall be always pleased to give you instructions in "Shop" on how to make spark coils and their accessories.—G. E. B.

Winding Manchester Dynamo.—W. D. (*Belfast*).—This correspondent sends me a tracing of a Manchester dynamo of the following dimensions, and asks: "About what quantity of wire will be required to wind it to give a current of three ampères at a pressure of 45 volts?" The dimensions are: yokes, 2 in. in width, 10 in. in length, ¾ in. in thickness; cores, 3½ in. in length between flanges; body, 1¼ in.

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in diameter: flanges, 3 in. in diameter; armature, built of laminated Pacinotti punchings, 3 in. in diameter and 2 in. in depth. I cannot see any flaw in your excellent tracing, but think you will not be wise in reducing the thickness of the yoke from ¾ in. to ½ in., as the heavier yoke will be an advantage in securing a steadier magnetic field. If the cores are of well-annealed cast iron, they will do equally as well as if made of wrought iron; but thinner flanges of wrought iron would be advantageous in yielding you more wire space. If you can manage to get 1½ lbs. of silk-covered No. 20 copper wire on the armature, and 6 lbs. of No. 22 on the cores, and connect the wires in shunt, you may get the current you require by driving the machine at a speed of 2,500 revolutions per minute. To get this result, the wires must be very closely and neatly wound.—G. E. B.

Electric Lamps.—G. W. (*Chelsea*).—I reply to your questions in order as they appear in your letter: (1) An electric lamp of 5 volts and 5-c.p. will take a current of 3 ampères, and this is a rate too rapid for a battery; 8-volt lamps are preferable. (2) All lamps, from 2½-c.p. to 20-c.p., are retailed by Mr. Bottone, Wallington. (3) A chromic acid or bichromate battery of four cells, each having a capacity of half a gallon, will supply current to an 8-volt lamp for from five to six nights with one charge of solution, if only used for three hours each night. If you only want a small night-light to see the time by night, and so on, see my reply on this subject to FRISKY, on page 683. (4) When using the current from a primary battery, such as that mentioned above, it is not necessary to employ a dynamo; but if you employ the portable secondary batteries supplied by Messrs. Cathcart, Peto and Radford, Hatton Garden, E.C., a dynamo will be needed to re-charge the cells when they are exhausted.—G. E. B.

Marine Boiler.—G. A. S. M. (*Birmingham*).—It is difficult to answer such a question without knowing more about your requirements. Do you want a regular marine boiler with internal tubes and smoke-box, for coal or charcoal, or do you want an externally fired one heated with spirit lamp, or a vertical one heated with coal or lamp? If you will give me an idea of your wants I will send a dimensioned sketch to suit you.—J.

Common Sealing-Wax.—A. W. (*Caterham Valley*).—A cheap strong wax may be made with powdered resin, 6 oz., and red lead, 4 oz., carefully melted over a slow fire. The *quality* of this may be improved (if cost is not objected to) by the addition of shellac up to 2 oz., and the *colour* by vermilion to a like weight. For sealing bottles, a sufficient wax may be made with two-thirds resin and one-third beeswax, coloured with a little venetian red.—M. M.

Phosphor-Bronze.—A. X. E. (*Nottingham*).—This is not really an alloy with a definite quantity of phosphorus, but a bronze which has been subjected to peculiar treatment. Bronze usually contains a quantity of cuprous oxide, which has been formed by the oxidation of some of the copper during fusion, and the presence of this oxide reduces the strength of the alloy. By adding phosphorus, the cuprous oxide is reduced to metallic copper, and a pure bronze of great strength and resistance is obtained. If the quantity of phosphorus added be the exact amount required to completely reduce the cuprous oxide, no phosphorus will be found in the resulting bronze; but, all the same, it will be still called a phosphor-bronze. Thus it is not a special alloy, but all bronzes can be converted into it. The phosphorus is added in the form of copper phosphide or tin phosphide, or some of each. Copper phosphide is made by heating a mixture of four parts superphosphate of lime, two parts granulated copper, and one part fine pulverised coal in a crucible at a moderate temperature. The melted copper phosphide, containing 14 per cent. of phosphorus, separates out at the bottom of the crucible, and should be quite black. Tin phosphide is made by placing a bar of zinc in an aqueous solution of tin chloride. The deposited tin is collected and put moist into a crucible, on the bottom of which are placed sticks of phosphorus. The tin is tightly pressed into the crucible, which is then gently heated till flames of burning phosphorus no longer issue from the crucible. The resulting tin phosphide is a coarsely crystalline mass of a tin-white colour. To convert ordinary bronze into phosphor-bronze, the alloy is melted, and small pieces of copper phosphide and tin phosphide are gradually added. The quantity added depends on the purpose for which the phosphor-bronze is required. Ordinary phosphor-bronze contains 2 per cent. or 2½ per cent. of phosphorus, and the best 3 per cent. or 4 per cent., although there is very little in the following analyses:—

Copper	90·34 . .	90·86
Tin	8·90 . .	8·56
Phosphorus . .	0·76 . .	0·20
	100·00	99·62

A bronze containing 7 per cent. to 10 per cent. of tin gives a phosphor-bronze of greatest hardness, and suitable for bearings, etc.—F. B. C.

III.—QUESTIONS SUBMITTED TO READERS.

*** *The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Steel Springs.—WING writes:—"Can any reader of WORK inform me where I could procure a supply of steel springs, similar to those used for American clocks, about ⅜ in. wide, but in lengths of 22 in., and coiled to a diameter of 3 in?"

Mounting Old Engraving.—F. E. D. (*Bridgend*) writes:—"Will some kind reader of WORK give me a little instruction in the following? I have an old and, I think, valuable engraving, which is pasted on an old newspaper, and has been folded so many times that it is nearly in four pieces. Can someone tell me the proper way to mount on canvas stretcher previous to framing?"

Early Riser's Friend.—WILL writes:—"Can any reader who has made that Early Riser's Friend, described on pp. 423-425 of No. 131, Vol. III. of WORK, tell me through 'Shop' how much brass and zinc I should require to make same, where I could procure them, and at what price?"

Photography versus Painting.—A. B. (*Glasgow*) writes:—"Could any reader of WORK oblige me with the best method of photographing from an oil painting, if there is any special preparation put on the painting, or any special lens in the camera? I have had this tried with several first-class cameras by men experienced in copying photos, both landscape and portraits. They have always failed at the paintings, and have spent largely both in time and money in experimenting. We all think it rather strange, as the picture is quite distinct on ground glass before dark slide is put in, and the exposure has been tried at all stages; but still there was something wrong, so I am anxious for the information."

Quick Drying Medium for Oil Colours.—JUNIUS writes:—"Can any reader inform me as to the medium used by rapid painters (known as lightning artists) which causes the colours to dry on the canvas in less than an hour? I want a similar process for some work I have in hand to be executed on card for novelties, etc. Also what ought I to use for priming the card, which is straw-board, to prevent colours from sinking?"

Dexter Fret Machine.—E. W. (*Cupar, Fife*) will thank any reader for the address of the maker of this machine, or of a *depôt* where parts may be bought.

Telephone.—A. J. (*Lhanbryde*) writes:—"Could any reader kindly inform me where I could get directions, with an accompanying sketch of a Pulsion Telephone, whereby I could construct an instrument of that kind?"

Roasting-Jack.—NEWSTEAD writes:—"Will any reader kindly inform me (1) How to remove the gold from some gold blocking on leather? I want it to appear as only blind blocking. (2) How to make an inexpensive roasting-jack to work automatically, but without clock-work arrangement?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Glass Blowing.—C. G. M. (*Penistone*) writes, in answer to SPES MEA (see p. 542, No. 138):—"By blowing glass on a small scale, I presume you mean, making such things as ignition-tubes, bulbs, T-pieces, etc., out of glass tube. This you can do with a blowpipe, but it requires perseverance."

Water Colours.—CHROMA writes, in reply to J. P. (*Belfast*) (see p. 574, No. 140):—"The pigments should be ground on a glass slab with a glass muller or flat-bottomed bottle, and mixed towards the end of that process with the medium; in this case a solution of gum senegal in distilled water—proportion, 1 oz. of gum ground to powder, carefully added to two fluid ounces of hot distilled water, and stirred and filtered. This should be kept in a large-necked bottle, covered, but not corked. Its keeping quality is improved by the addition of a lump of camphor. In the process of mixing with the pigment, a very little glycerine is incorporated, and it is this which keeps the colour moist. Sometimes honey is used for the latter purpose, and was invariably so. Of course, different colours require different proportions of medium, but these can only be ascertained by practical experience or experiment; but roughly speaking, the less the medium and the more the pigment the better, but always pure distilled water."

Book on Locks.—W. H. (*Edinburgh*) writes, in reply to J. G. (*Bloomsbury*) (see p. 478, No. 134):—"There is a book on the subject of locks, etc., in 'Weale's Series,' published by Lockwood, late Weale; the price is about 2s. 6d."

Ivory Tablets.—LIFEBOAT writes, in reply to SEA GULL (see p. 574, No. 140):—"Try the Endolithic Ivory Company, Limited, 61½, Fore Street, London, E.C. They make a speciality of this kind of thing; at any rate, they are largely patronised by organ and harmonium manufacturers for draw knobs."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—J. A. (*Halifax*); E. & S. (*Blackburn*); PROFESSIONAL; R. L. G. (*South Shields*); S. W. (*South Darenth*); J. A. (*Parsonstown*); W. B. McG. (*Dumfries*); C. L. (*Beverley*); IRON FRAME; A. D. (*Sheffield*); J. W. B. (*Birmingham*); W. L. (*Oldham*); ORGAN BUILDER; J. W. R. (*Liverpool*); CREDE SIGNO; W. T. (*Newcastle*); CONSTANT READER; R. L. (*Ruabon, North Wales*); J. H. (*Keighley*); J. P. (*Accrington*); WICKER; VICTOR CYCLE CO.; L. T. (*Liverpool*); J. H. T. (*Earlsheaton*); A NEW READER; W. T. (*Leicester*); H. M. (*Acton*); W. R. (*Dulwich*); T. B. (*Clapham*); D. S. R. (*Cambuslang*); G. H. A. (*London, W.*); M. T. (*Edinburgh*); G. W. (*Bournemouth*); J. S. H. (*Chatham*); W. J. (*Newchurch*); LEARNER; H. S. M. (*Ripon*); J. R. (*Burnbank*); BRISTOLIAN; SEMPER FIDELIS; MENDIP; T. S. (*Bognor*); TURNER; C. R. (*Ealing*); T. H. B. (*Halifax*); A. M. B. (*Dublin*); SUBSCRIBER; A. D. (*Birmingham*); C. R. S. (*Boston*); J. F. W. B. (*Leicester*); P. P. (*Withington*); H. M. S. (*Bootle*); A. McK. (*Manchester*); J. C. (*Manchester*); W. S. (*Cambridge*).

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